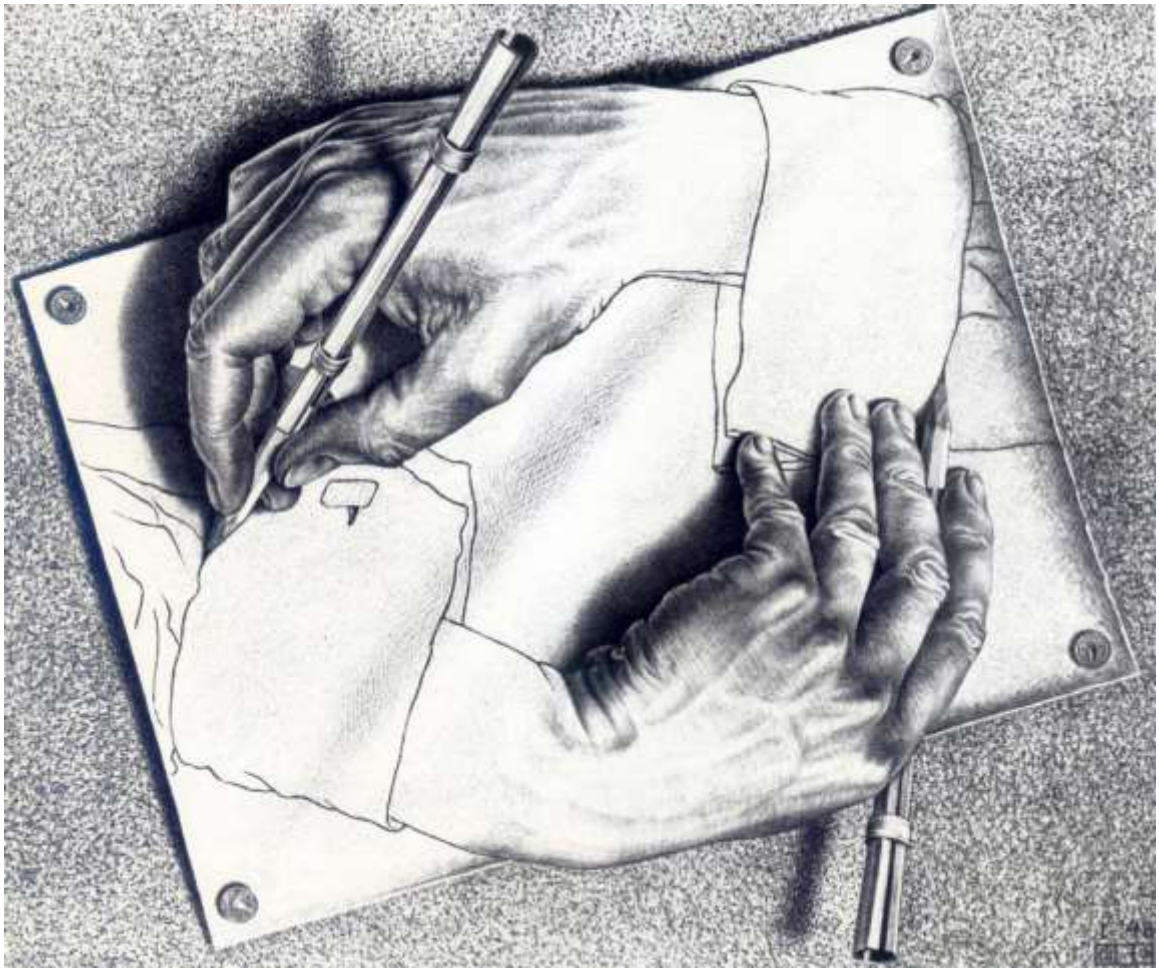
Pen & Pencil Magazine



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Cover picture: Escher, Two Hands

If you have a submission for the **Pen & Pencil Magazine** feel free to contact the Editor in Chief at

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Instead I dreamed of him ... this kind and gentle man ... inviting me into his Atelier so he could draw me in all my beauty and my splendour. I saw myself as his Odalisque ... I imagined him as Poseidon in his splendour. I imagined his largess ...

No longer am I bored. Instead I desire to chat with him again sometime very soon.

He is a handsome and eligible man ... A friend who is just a few steps away …

Isabella Nontsouris

Pen & Pencil Welcomes Submissions

Obelisk Press of Vancouver is pleased to publish the Twentieth edition of ***Pen & Pencil Magazine*** which serves to feature the work of aspiring writers.

Pen & Pencil Magazine welcomes submissions on a quarterly basis.

The ***Pen & Pencil Magazine*** board is comprised of the unpaid volunteers: Please feel free to send your short story, prose, poetry and artwork submissions to the Editor in Chief at

pbruskiewich @ gmail.com.

There is no fee to submit. There is no writer's fee provided by the journal for those who submit. The publishing rights remain with the writer.

New Prose

A Tale to Make You Day Dream by Leigh Clarke

Being a naturist is one thing — being a life model is something else entirely! Carolyn had thought that taking her clothes off and sitting still for a couple of hours would be an easy way of earning money. Unfortunately it hadn't turned out that way. To start with, she wasn't very good at staying still, and the positions they wanted her to hold would have tested the suppleness of an acrobat.

Then again, there was no-one else in the class under sixty years of age and although they were all very nice to her she didn't feel she had much in common with them.

The class was held between two and four-thirty on a Friday m, afternoon in the village hall. It was hardly an ideal location as the passing lorries shook the whole building until the windows rattled and the floorboards bounced. And of course they had to draw all the curtains and work by artificial light in case any passer-by should decide to try and peer in. Carolyn hated the dusty, yellow glow of the lights and she was thoroughly bored with staring at the faded banners that the Salvation Army stored at the back of the hall between their Sunday parades. Of course the money was good, and if she'd had something interesting to look at or listen to, she was sure she would have been able to sit without moving a muscle for hours.

Once she took along her cassette player and some lively. music but the class had complained that it was too distracting. She had to admit that perhaps the

Rolling Stones weren't to everybody's taste! On the other hand, she loved to see the drawings they had produced produced by the end of the session. The twenty or so aspiring artists were of wildly varying ability. There was Ron, who could scarcely produce more than a stick figure after two hours slaving over a hot sketchpad. By contrast Colin turned out sketch after sketch, his hand flying over the paper at amazing speed. Carolyn wished that she really looked like the slim, elegant young woman whose image emerged from Colin's easel. Although it was recognisably her, he somehow transmuted her plumpness to enticing curves, her unruly frizzled hair to elegant ringlets and her fat little hands into something a manicurist would have been proud of.

It was Colin who had shown her how she could look if she really tried — and his sketches had inspired her to go on a diet and have a good haircut. To her great surprise and pleasure, she was already starting to look more like the ideal woman that he drew, and it was doing wonders for her self-confidence.

Nevertheless there was no getting away from the fact that the class was boring, and it was getting more and more difficult for her to motivate herself to go along each week.

It was all a far cry from nudity as she understood it. She relished being naked in the fresh air, feeling the breeze moving across her body, or the delicious shock of plunging into a swimming pool and feeling the tingling response of her nerve ends to the cold water. She adored playing mini-ten or

volleyball with the kids at the club, or just sitting and chatting with her friends whilst soaking up some rare English sunshine.

Getting a numb behind and pins and needles in her legs from sitting on an uncomfortable horsehair sofa didn't bear any resemblance to the joys of naturism as she understood them. Calling it a life class was a joke — there was more life in an undertaker's window!

She never quite understood whether it was boredom, or simple devilment that suddenly prompted her to suggest an outdoor life class.

It was a hot afternoon and the-hall was dustier, dimmer and more boring than ever before. The class muttered quietly to themselves and she could hear the scratching of charcoal on paper and the frantic sharpening of pencils.

She was stretched out on her back, with nothing to look at but the ceiling, and she was suddenly reminded of a stuffed trout that was displayed in the local fishing-tackle shop's window. She realised that she and the trout had a lot in common, they were both immobile and glassy-eyed and they were both carefully arranged to maximum advantage on a piece of blue cloth!

The idea struck her as hilarious and she started to giggle. Of course this destroyed the pose she was supposed to be holding and she had to sit up to avoid getting hiccups. Once she had recovered from her laughing fit she had to explain to the class what it was that she had found so amusing. She could

hardly tell them that she had been comparing herself to a stuffed trout, so she said the first thing that came into her head.

‘I was just wondering if it wouldn’t be fun to have a life class in the open air for a change?’ she said. And that gave her a mental image of the class gathered round her in the car-park with their easels and camp-stools and all the HGV drivers veering all over the road as they realised what was going on! So, she got the giggles again, and as it was nearly four-thirty and there was no point in setting up another pose, the class broke up a little early, but in good humour.

On her way home she just couldn’t stop laughing each time she thought of a different location to take the class to: by the fountain outside the Town Hall, on the green by the police station, or in Marks and Spencers’ food hall! Perhaps one day she would really be able to take the class to some secluded area and show them how nudity should really be depicted.

In the meantime she had found a way of fighting the boredom of Friday afternoons. All she had to do was imagine herself in some exotic location and spend a couple of hours daydreaming about sun, sand and surf. The best way to put some life into her life class was bring it with her!

{first published H & E, July 1992}

Psychopathy, As Close as a Street Corner Near You, by Patrick

There are many psychological foibles that you can see when you walk the streets of a modern city. One of the foibles that is present just beneath the surface and is somewhat prevalent is narcissism. On average, around the world, narcissism afflicts around 5 % of the population as a whole, and is due partly to nature and partly to nurture. In some societies, particularly when there is a cultural arrogance, narcissism afflicts upwards of one in ten. Sometimes during periods of societal distress this pushes up the numbers.

The term narcissism was first described several millennia ago by the Roman poet Ovid in his work *Metamorphoses: Book III*. Ovid's myth is about Narcissus, a character cursed to fall in love with his own reflection. In modern times the psychologist Havelock Ellis used the term narcissism in 1898 to link the description of Narcissus to behaviour he observed in his patient. In 1905 Sigmund Freud, the founder of psychoanalysis, defined "narcissistic libido" in his book book *Three Essays on the Theory of Sexuality.* The psychologist Robert Waelder published the first case report in 1925 of pathological narcissism, describing "narcissistic personality." In 1968 "narcissistic personality" would be included for the first time in the DSM.

There are sometimes a clustering of other personality traits when a person displays a "narcissistic personality." For instance they may show dramatic and antisocial behaviour, as well as an indifference to the harm they are causing others.

One step past "narcissistic personality" is psychopathy, something that afflicts perhaps 1% of the population as a whole, and is somewhat dangerous. A statistically significant number of criminals are afflicted by Psychopathy.

In civil interactions there are perhaps two broad categories of individuals, those that act in a civil fashion because they have a kind heart and understand the consequences of their actions, and then those who are uncivil and hope there will be no meaningful consequences. The second category hope there is no ‘punishment’ for the uncivil action.

When the Covid-19 epidemic afflicted Canada about 90% of Canadians acted in a civil fashion, while about 10% acted in an uncivil manner. This ten percent is responsible for upwards of 10,000 needless additional deaths due to Covid-19 in Canada or about 15% of the mortality. In most cases the additional Covid-19 deaths due to uncivil behaviour were of people other than themselves. The uncivil behaviour harmed others.

This past week I encountered a woman that displayed a harmful, dramatic, antisocial "narcissistic personality." She also appears to be afflicted with Psychopathy.

I was sitting by myself at a public bus stop on the south side of a major shopping centre on the North Shore. It was mid morning, on a lovely February day. There were several empty benches at three bus stop kiosks. I

have asthma and so I was sitting at the kiosk furthest away from the bus stop itself, where a number of people were gathered.

After a few minutes I suddenly smelled an awful odour, started to cough, and turned only to find a woman had sat herself next to me and was vaping. I told her I had asthma and politely asked her to go elsewhere if she wanted to vape.

She smirked at me took another puff of her vaping and in a dramatic fashion blew the smoke into my face. In this she displayed a "narcissistic personality." In this she was obviously indifferent to the harm she was inflicting on someone else.

I then made mention to her that there is a bylaw, bylaw 4607, that makes it illegal to smoke and vape at bus stops in our community. I explained the bylaw is necessary because one-in-four people in our community are elderly, infirm or have cardiopulmonary issues. I told her the bylaw was to protect public health and safety.

She smiled with a *Cheshire Cat* smile and put away her vaper in her purse. Fine, I thought, this little drama was over. But no ... instead ... she took out a cigarette and lit it, with glee I made add. This was is clearly psychopathic behaviour on her part.

I told her I did not want to be assaulted by her and her smoke. I stood up and backed away from her and told her I would be taking her picture and

sending it to our community mayor so that there was a record of what she had just done.

I also told her as well that I would tell the bus driver not to let her on his bus because she was smoking at the bus stop, and was indifferent to the harm she was causing others. I told her that the buses have cameras and so she would be recorded so that the Transit Police could deal with her at some future day.

I then walked away and stood near the others who had witnesses what she had just done. I had spoken loud enough so that there were witnesses to her uncivil actions.

When she realized how the others were staring at her and were clearly displeased with what she had just done, she got up and walked away.

You can easily recognize her by the gaudy gold rings she is wearing and her gaudy gold cigarette lighter ...

At this point I wondered if she was there at the bus stop to catch a bus or was there just to tickle her fancy, as a psychologist friend of mine would describe her motivations.

This is the second time in less than a year where I have come across such psychopathy on the streets of my community. The penultimate time was last spring when a ‘bonger’ decided ‘to coke up’ in front of our local library.

Here is the picture. Notice the smirk on her face.

Pictorial: Pretty Polly from Bizarre Magazine

My Aversion to Water by Colleen Monterrosa

[**Mexico City**] I grew up in Mexico. Supposedly when I was just a few weeks old I died and then was reborn. My mother was giving me a bath in my little pink bathtub when her cellphone rang. She left me alone for perhaps twenty seconds to fetch her cellphone and by the time she had returned I had slipped under the water, drowned and was turning blue.

She lifted me out from under the water, grabbed me by the legs and flipped me upside down to drain the soapy water from my lungs, got me breathing again and then took me to the hospital. I was in the hospital for observation for several days.

At such a young age there is no way of knowing how such a trauma will affect you. Even today, sixteen years later we don't really know. Being a baby I was too young to remember my drowning … first hand … but psychologically I have an aversion to water. Being told you had died, is a bit of a twofold shock.

Last year I found out about my drowning indirectly when I sought counselling, through my school, for some of my phobias. It was my counsellor who asked my mother about why I have an aversion to water. My mother sat me down and told me what happened. She cried for days and days afterwards. My mother's confession has distanced her from me, but that is not of my doing, but hers.

Girls like to take baths. Boys like to take showers. Even if I sit in a bathtub with a few centimeters of water I panic and have to hop out. I am a girl who likes to take very quick showers. The feel of water against my skin affects me. In a few seconds I start to get anxious and in a minute or two I start to panic.

Just a few weeks ago when I was caught outside in a rain storm and I had to go to the hospital when I went into a full blown anxiety attack. I was in the hospital for observation for several hours.

This month I went to summer camp. Several activities included the lake like canoeing and swimming. I had a doctor's note to say I was to be excused from any water activities because of my aversion to water. There was a camp volunteer that was assigned to me so that we could do things together while the other students did their canoeing and swimming. He was a clever young man …

One afternoon we went for a hike around the lake. The hike was perhaps two or three kilometers long. It went up and down and so the actual distance we walked was longer. It was a hot afternoon and before long we were both sweating. We stopped to sit and cool off in the shade and chatted. He asked me why I had an aversion to water and so I told him. He told me he had once drowned in a lake when he was my age and well he survived the trauma. I felt very close to him after he shared this with me. Here was someone who could understand.

I asked him whether he had an aversion to water and he said no. I was surprised! He explained that when he fell into the lake he did not know how to swim. Now he knows how to swim and so he doesn't panic in water anymore.

I told him that I don't even like the feel of water on my skin.

He told me he would teach me how to swim. We stayed near the shore so that if I stood my feet touched the bottom and so I was safe. He first taught me how to float and thread water. Then he taught me how to swim on my back.

I let him hold me and from time to time I felt a tingle between my legs. It was this tingle that helped me calm my anxiety. I soon found I had to swim on my stomach because my excitement showed through my bathing suit, top and {blush} bottom too.

In a few days I was swimming in the lake, but I still felt anxious when I was in water.

By the end of the camp I knew how to not to panic around water. Now I even take baths instead of showers. What is interesting is that my fear has been replaced by a special pleasure … that only a girl can have.

Pictorial: Being Shy …

I was bored and between boyfriends by Isabella Montsouris

[**Montreal**] It was a Sunday night and I was lonely. There wasn't anything to watch on TV. I was bored and between boyfriends.

The tingle in my belly and my sex told me I was ovulating. I was aroused, horny in fact.

What was a girl to do? I was happy to nest ... but not happy to be alone. My last boyfriend and I had split up a few weeks ago and so for the first time in two years I was *sans amis* ... *sans penis* ... when I most needed one.

My 'little rabbit' had stopped jumping. I had bought 'ma *petite lapin*' the day I split up with my boyfriend. My first. But I didn't have spare batteries. I should have bought the rechargeable vibrator, or at least some rechargeables. My TV clicker only has two ...

I'll know better next time. Pity my bed doesn't have bed posts. I didn't even have a single root vegetable in my refrigerator!

The walls on my apartment seemed to be pressing in on me. I needed to get out, but I decided against going for a walk. I didn't trust myself! Here at night I knew I'd pounce upon the first handsome and eligible man I set eyes on.

I really needed to step out ... even just for a few minutes.

Why does a twenty five year old woman feel this way when she ovulates or when she menstruates? It's just not fair that men don't have to endure this! They'll never understand women no matter how hard they try ... Men are really just big dicks!

My ex had made a pass at my BFF. Later he wouldn't own up to doing this. A woman will always trust their women friends over their boy friend ... so why even try?

Wasn't I enough for him? My French Canadian BFF told me my ex was hitting on her. We decided to set a red line which if he crossed would mean ... out the door he goes.

Boy did he cross the line. Do you really want me to tell you what he did? If so ... then read the next few paragraphs. If no ... go to the next page.

My BFF takes walks along the seawall at night to help her relax and sleep. She is a type A person with OCD and a few other afflictions. She goes through boy friends as often as she empties out boxes of Kleenex. She loves to play with 'boy's toys' but after awhile they always run dry. (you can figure things out can't you?) She doesn't enjoy sex.

My ex knew of her nightly routine and her cravings and so he sat at a bench next to the seawall, knowing full well she would walk by. Come to think of it, I may have told him all about her! He could have just said hello and a

few niceties to her and then left things at that, but no, he had other ideas. That evening he joined her on her walk, and the next night, and the next.

She told me right at the beginning what was going on. The next night I said to him "let's go for a walk on the seawall ..." He said he was busy and couldn't. It did not twig on him that I knew what he was up to. Or perhaps he did and he was up to something else.

Do you think he wanted to break up with me? Were we not good in bed ... isn't that what men are really looking for from their girl friends? To thrust ... thrust and thrust?

The third night he got my BFF to give him a hand job. She obliged because I let her!

Yes, later he wouldn't own up to what he was doing. What a dick ...

The following day we met for lunch and immediately after he sat down my BFF sat down next to him. He turned beet red. She described his penis to him loud enough so everyone could hear. I told him I never wanted to talk to him or ever see him again. My BFF added "you have a small one by the way, and not very impressive when it pops ..."

The expression on his face was priceless ...

My BFF and I had a splendid lunch and afterwards we went shopping together. That was the afternoon I bought '*ma petite lapin*' My BFF recommended it to me and even helped me pick mine out. It is pink with two protuberances, one large and one small. It fits me just right. One size does not fit all so you really have to know your own body. They let you measure yourself for good measure because it being an intimate toy, you cannot return the vibrator after you have used it. It has six settings ... slow to WOW!

We bought jelly as well. You can't really do WOW on '*une petite lapin*' without jelly.

She came over and showed me how to enjoy the '*la petite lapin*.' First I watched her .... It was a thrill to watch her climax. Then it was my turn ... and it was a double thrill to be watched while I had an orgasm! I had never shared a bed with a girl before. OMG!

The day my batteries ran out I had just gone to do my laundry at my mother's. I live in an apartment building with common laundry rooms on each floor. I don't like doing my clothes washing in common laundry rooms. You never know what you might catch ...

I guess I should have brought my laundry up from the trunk of my car right when I got home that afternoon, but I hadn't. About eight that night I figured I would dash down to the back parking lot and get my things, and

then dash back into my apartment. All I had on was a long grey sport shirt, no bra or panties. I don't wear anything when I am alone.

I didn't think I would run into anyone after dark, so I dashed down with togs on my feet. I was using a shopping cart and one of my large travel case on wheels to take things up from my car. But lo and behold along came one of my neighbours...

He is an elderly gentleman I bump into and chat with from time to time. He is an artist and a creative person. He once told me he sometimes sits as Poseidon for artists. When he walked up and stood beside me I had a strange, but good feeling. My nipples were tingling and hard. Maybe it was the cold or maybe it was the excitement of the moment?

I was embarrassed to turn to face him because I was very aroused. I have big boobs and giant nipples that stand erect when I am horny. We both waited for the elevator together. Out of the corner of my eye I sensed he was standing politely behind me and to my left. I knew I did not need to put an arm across my breasts to hide their splendour.

Quietly he said "it has been a year since we last chatted ..." When he said this I remembered that conversation. I had met him as I left the elevator in the lobby on my way to a girlfriend's wedding. I was dressed to the nines in a white silk dress that had bare shoulders as a maid of honour. He had tipped his hat and said 'you look like a goddess ...' There is an elegance to this man that reflects his age and experiences.

There was an awkward pause then he said quietly “It is always a pleasure to see you and chat with you.” The tingle in my belly and my sex flooded over. I felt very happy.

When the elevator arrived I turned away from him and invited him to go first. Instead he said “I am an old naval officer. Ladies go first in my world.” So I pushed the shopping cart into the elevator. Before I could step out again for my stand alone travel case he had wheeled it into the elevator for me ... but he did not look up at me.

It was then that I knew for certain he knew I was in my full splendour, yet he did not want to embarrass me. I covered my breasts and leaned forward to press the button. He gave me a warm smile as the door closed and the elevator began to lift me to my floor.

He knew that I was wearing nothing but a grey shirt. I could tell because of the bulge in his pants. I was very wet between my legs! That night I didn’t need ‘*ma petite lapin*.’

Instead I dreamed of him ... this kind and gentle man ... inviting me into his Atelier so he could draw me in all my beauty and my splendour. I saw myself as his Odalisque ... I imagined him as Poseidon in his splendour. I imagined his largess ...

No longer am I bored. Instead I desire to chat with him again sometime very soon.

He is a handsome and eligible man ... A friend who is just a few steps away …

Pictorial: Bet You Can't Do This …

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Canadian Poems

Two Poems by Arthur Wentworth Hamilton Eaton:

By the Bridge

With subtlest mimicry of wave and tide,
Of ocean storm, and current setting free.
Here by the bridge the river deep and wide.
Swaying the reeds along its muddy marge.
Speeds to the wharf the dusky coaling-barge
And dreams itself a commerce-quickening sea.
Wide sedge-rimmed meadows westward meet the eye,
Brown, silty, sere, where driftwood from the mills
Is thrown, as Spring's full flood sweeps by,
And weeds grow rank as on the wild salt-marsh,
And lonely cries of sea-gulls, loud and harsh,
Pierce evening's silence to the echoing hills.
The scene, with all its varied, voiceless moods,
My eyes have looked upon so many years
That like my mother's songs, or the deep woods
In whose mysterious shade I used to play,
Weaving sweet fancies all the summer day,
It has strange power to waken joy or tears.
I love the lights that fringe the farther shore,
Great golden fireflies by a silver mere;
Mysterious torches they, that o'er and o'er
Recall to mind the dear souls gone, not set

Cold-gleaming crystals in God's coronet,
But gems that light our way with ruddy cheer.
Sometimes inverted in the wave they seem
Like orient palace-roofs and towers aflame
With rubies, or those sapphire walls that gleam
Amidst the visions of the holy Seer,
Who by the blue Aegean, with vision clear.
Saw splendours in the heavens he might not name.
When all the river lies encloaked in mist
So far away those trembling orbs of light
They symbol memories fair that still persist,
With glow or glimmer, of the shrouded years
Before we left, for laughter, cries and tears.
That world serene where souls are born in light.
I cannot watch unmoved the sunset here,
When swift volcanic fires of liquid gold
Alight on hills of purple haze appear.
And clouds, deep-crimsoned in the day's decline,
Like snowy festal-garments splashed with wine.
Lie careless, resting fleecy fold on fold.
So deep the meanings in these changing moods
Of earth and heaven, that I who reverent stand
Before a flower, and in the sombre woods
Hear speech that silences the common creeds,
Stand lost in wonder, like a man who reads
Immortal prophecies none can understand.

I Watch the Ships

I watch the ships by town and lea
With sails full set glide out to sea,
Till by the distant lighthouse rock
The breakers beat with roar and shock.
And crisp foam whitening all the decks;
While deep below lie ocean's wrecks.
What careth she!
I stand beside the beaten quay
And look while laden ships from sea
Come proudly home upon the tide
Like conquering kings, at eventide;
Or from fierce fights with wintry gales
Steal harbourward with tattered sails,
O cruel sea!
I pass the ancient moss-grown pier
Where men have waited year by year
For ships that ne'er again shall glide
By town and lea on favouring tide.
Strong ships that struggled till the gales
Of winter hid their shrouds and sails
In ocean drear.
With sails full set young spirits glide
From harbour, on a sea untried,

To breast the waves and bear the shocks
Beyond the guarded lighthouse rocks.
To strive with tempests many a year;
Strong souls, indeed, if they can bear
    Life's wind and tide!
I watch beside the beaten quay
The surf bring back all joyously
To anchor by the sheltered shore
Some laden deep with precious ore,
Or spices won from perfumed sands
Of rich, luxuriant tropic lands,—
    O kindly sea!
But some come back on wintry gales
With broken spars and shattered sails
And fling to shore a feeble rope;
While many a loving heart in hope
Waits on for ships that nevermore
Shall anchor by a friendly shore,
    O sad, sad sea!

Pictorial: Trouble Ahead

In March by S. Frances Harrison

Here on the wide waste lands.
Take—child—these trembling hands.
Though my life be as blank and waste.
My days as surely ungraced
By glimmer of green on the rim
Of a sunless wilderness dim,
As the wet fields barren and brown.
As the fork of each sterile limb
Shorn of its lustrous crown.
See—how vacant and flat
The landscape—empty and dull,
Scared by an ominous lull
Into a trance—we have sat
This hour on the edge of a broken, a grey snake-fence,
And nothing that lives has flown,
Or crept, or leapt, or been blown
To our feet or past our faces —
So desolate, child—the place is!
It strikes, does it not, a chill,
Like that other upon the hill,
We felt one bleak October?
See—the grey woods still sober
Ere it be wild with glee,
With growth, with an ecstasy,

A fruition born of desire.
The marigold's yellow fire
Doth not yet in the sun burn to leap, to aspire;
Its myriad spotted spears
No erythronium rears;
We cannot see
Anemone,
Or heart-lobed brown hepatica;
There doth not fly,
Low under sky.
One kingfisher—dipping and darting
From reedy shallows where reds are starting,
Pale pink tips that shall burst into bloom,
Not in one night's mid-April gloom.
But inch by inch, till ripening tint.
And feathery plume and emerald glint
Proclaim the waters are open.
All this will come,
The panting hum
Of the life that will stir,
Glance and glide, and whistle and whir,
Chatter and crow, and perch and pry,
Crawl and leap and dart and fly,
Things of feather and things of fur,
Under the blue of an April sky.
Shall speak, the dumb,

Shall leap, the numb,

All this will come.

It never misses.

Failure, yet —

Never was set

In the sure spring's calendar.

Wherefore—Pet —

Give me one of your springtime kisses!

While you plant some hope in my cold man's breast —

Ah! How welcome the strange flower-guest —

Water it softly with maiden tears.

Go to it early—and late—with fears;

Guard it, and watch it, and give it time

For the holy dews to moisten the rime —

Make of it some green gracious thing.

Such as the heavens shall make of the spring

Prose from the 1920's

This Modern Living by Arnold Bennett

A Study of the Difficulties Which a Complex Civilization Presents for the Women of Today

[**New York, 1929**] An example is worth ten general statements of what is. I give an example, known to me, of the role of a woman in this modern living. Her husband is a busy professional man. He is also a man not notable for tidiness, and has to be followed about in the house by a wife who transforms his disorder into her order. His profession necessitates various social contacts, so that the pair are frequently entertained and frequently entertain. In practice the entertainer is of course his wife. The husband comes in and enlivens the meal; but it is the wife who has organized the meal. For certain reasons the entertaining and the being entertained involve late nights. But the wife must be up early, for she escorts her young children to school, and, no matter what time the mother has gone to bed, the school exacts punctuality. She often drives the car, and—more trouble¬ some—she parks and garages it.

Like most of us she is always preoccupied with the two grand problems of this modern living: satisfactory domestic service, and making both ends meet. She always designs her own frocks and sometimes makes them. When the pair go away for a holiday she first packs for herself and then packs for her husband, who cannot be trusted to pack for himself. She, keeps the family accounts. She battles with tradesmen, and with pedagogues, and with the ill- health of the family, for when a malady supervenes she is the nurse as well.

“Well,” you say, “there is nothing very extraordinary in all that.”

Admitted. But I have incidentally to add that the wife also follows a profession.

Another example: a modern couple, at whose house I attended a dinner of over thirty covers. It was a good dinner, served with perfect tranquillity and without delay.

The point is that they had no servants— only a morning help. An intimate guest here and there inobtrusively assisted, according to previous arrangement. I was so intrigued by this amazing feat of entertaining that, being of an inquisitive and informal disposition, I said to my hostess after the dinner was finished:

“I want to see your kitchen.”

The kitchen, radiant as a kitchen in some Ideal Home exhibition, was utterly empty of debris. In the scullery all the dirty crockery lay neatly assorted in piles to await the advent of the help the next morning.

Such is this modern living. It is very different from the ancient living which even I, who am not yet quite as old as Methuselah, can well remember. All the new developments affect women more than men. For both sexes there are more, and more various, interests demanding physical and mental activity. We have more games, more holidays, more diversions, more public spectacles,

more change, more entertaining, and more arguments—particularly about the national welfare and the relations and comparative value of the sexes; indeed more everything, except perhaps sleep.

But men had always their present interests. Men are doing nothing today which they did not do aforetime. Women are now doing all sorts of things which they used not to do and which then they were not expected to do; and speaking broadly they are besides still doing all the things which they used to do. The demands on the energy of women have tremendously multi¬ plied. The women of this age have to be, and are, political, financial, sociological, criminological, artistic, scientific, intellectual. They must and do keep abreast of every manifestation of human activity. They must and do take part with intelligence and knowledge in all discussions. They read the "woman's page" of newspapers. But they read the other pages too. Books, plays, films, murders, politics, sports, fluctuations in the stock market—these and a hundred other matters all come within the scope of their comprehension and their criticism.

When men "join the ladies" their conversation is no longer narrowed down to suit the limitation of lesser minds; it continues in full, wide stream. Women still see things differently from men, and always will; but they do see. Formerly they did not see; for they merely did not look.

Add to all this the influence of two other indisputable facts. First, that the woman's business of running a home has become much more difficult than it was. Second, that women give much more time and brains and enthusiasm to

personal appearance than they did. And you will wonder how on earth women contrive to get through with the job of living on the old time-allowance of twenty-four hours a day.

And you will not wonder at the complaint which you hear on all sides about the resulting excessive strain upon their nervous energy. This complaint is justified. If women in old days did not live excitingly enough, they now live too excitingly.

Women somehow cannot leave out trifles. They will not admit that trifles are trifles. They are reorganizing their existences with¬ out having properly grasped the great truth that the basis of good organizing is a sense of proportion.

The first-rate organizer is never in a hurry; he is never late; he always keeps up his sleeve a margin for the unexpected. This is so well known that everyone in need of help goes by instinct to the busy, organized man. It is only the illorganized, busy person who has no spare time for others. Women on the contrary are too often in a hurry. In addition to expecting too much from human nature, they expect too much from clocks; they have a superstitious notion that, when it is convenient to them, the hands of clocks will cease to move.

One final suggestion. Time was always precious, but never so precious as in this modern living. The aim is continually to save time. Now in certain states of mind the best way to save time is to waste it. One of the most furious and

successful workers of the twentieth century made a habit of spending a day a week in bed. I rather doubt whether any woman would be capable of a procedure so drastic; nor would I dare to demand it of any woman.

But I would respectfully suggest to every woman who feels herself "rushed" that between one task and the next she should lie down, relax her muscles, shut her eyes, and empty her brain for five minutes.

She would lose the five minutes, but she would most assuredly gain more than five; and she would gain, too, the invaluable sensation of serenity in the modern storm.

Pictorial: An Uncovered … Cover …

On the Approach of Middle Age by Somerset Maughan

[**London, 1923**] It is like any other of the necessary trials of life, such as marriage or death; you think of it vaguely as something that must be endured, but you seldom give it serious consideration till you are face to face with it. A man will hardly wait to learn swimming till he is thrown into the sea, but he will take no thought for his conduct in a crisis which is as dangerous and, unlike the other, by no prudence to be avoided.

Before he knows where he is, he finds himself floundering in the perilous forties. He is now that baldish, stout person whom twenty years before he jeered at when he saw him dancing, a little out of breath, with girls who might be his daughters. He is now the gentleman in the Rolls-Royce, smoking a long cigar, whom he used to outdrive at golf by thirty yards and who wilted not a little towards the end of the second round. Yesterday, he was a young man, and today he drinks lithia water.

Because, as a lad, I had seen much of the world and traveled a good deal, because I was somewhat widely read and my mind was occupied with matters beyond my age, I seemed always older than my contemporaries; but it was not until the outbreak of the Great War that I had an inkling of the horrid truth. I learned then, to my consternation, that I was a middle-aged man. I consoled myself by reflecting that I could be thus described only militarily, so to speak; but not so very long after, I had an experience which put the matter beyond doubt. I had been lunching at a restaurant with a woman whom I had known a long time, and her niece. This was a girl of sev¬ enteen, pretty, with blue

eyes and very pleasing dimples. I found it vastly agreeable to look at her, and I did my best to amuse her. She rewarded my sallies with rippling laughter. Well, after luncheon we took a taxi to go to a matinee. My old friend got in, and then her niece. But the girl sat down on the tip-up seat, leaving the empty place at the back beside her aunt for me.

Painful Discriminations

For a moment I stood rooted to the pavement. Amid the clatter of street cars and the screams of klaxons I heard the ominous tolling of a bell. It was the knell of my dead youth. In the gesture of this maiden, I discerned the civility of youth (as opposed to the rights of sex) to a gentleman no longer young. I realized that she looked upon me with the respect due to age. Respect: it is a chilling thing for a girl to give to a man. The boat had given a sudden lurch, and there was I, all unprepared, struggling for my life in an unknown sea.

It is not a very pleasant thing to recognize that for the young you are no longer an equal. You belong to a different generation. For them your race is run. They can look up to you; they can admire you; but you are apart from them: for boys you are no longer a competitor, for girls you are no longer marriageable. It is only the widow of a certain age who still casts an inquisitive eye on you. You may just as well marry and have done with it.

I think I have always been more conscious of my age than most men. It is generally supposed that the young live in the present, but I know that I lived only in the future. I was ever looking forward, generally to something I

proposed to do in some place other than that in which I found myself; and no sooner was I there, doing what I had so much wanted, than it became of small account, for my fancy raced forward and I busied myself with what next year would bring. I never enjoyed the daffodils of today, because I was always thinking of the roses of tomorrow. Sometimes I think that it is the unimaginative who get the most out of life, for to them alone the fleet¬ ing moment is all in all.

My youth passed me unnoticed, and I was always burdened with the sense that I was growing old. To me, nothing is more wonderful than the consciousness of youth which in these days the young have. They are deeply aware that it is lovely and fugitive. They know, as we of a past day did not, that it is precious, and that they must make the most of it. I was young in an elderly world. Then people shrugged their shoulders at youth; it was an indisposition which time would cure, and the young were impatient to grow older.

The Compensation of Age

But middle age has its compensations. One is that, on the whole, you feel no need to do what you do not like. You are no longer ashamed of yourself. You are reconciled to being what you are, and you do not much mind what people think of you. They can take you or leave you. You do not want to impose upon them with false pretenses. Youth is bound hand and foot with the shackles of public opinion.

I was never of great physical strength, and even as a lad long walks tired me; but I went on them because I would not con¬ fess my weakness. I do not mind now, and so I save myself much weariness. I hated cold water, but for many years I took cold baths and bathed in cold seas because I wanted to be like everybody else. I used to dive from heights that made me nervous, because I was afraid of seeming afraid. I was mortified because I played games less well than my companions. When I did not know a thing, I was ashamed to confess my ignorance; and it was not until quite late in life that I discovered how easy it is to say: I don't know. I am prepared now to admit cheerfully that I never can tell where I and J come in the alphabet. I find that my neighbors do not expect me to walk five and twenty miles, or to play a scratch game of golf, or to dive from a hateful board thirty feet from the water. That is all to the good, and makes life much less unpleasant; but I should no longer care if they did. It is discreet even in middle age to treat the opinion of your fellows with a show of politeness, but in your heart you can cock a snook at them.

When I left school (gathering my passion for freedom into a compact symbol), I said to myself: henceforward, I can get up when I like and go to bed when I like. That, of course, was an illusion; and I soon found that the trammelled life of civilized man only permits a modified independence. When you have an aim, you must sacrifice something of freedom to achieve it. But by the time you have reached middle age, you have discovered just how much freedom it is worth while to sacrifice in order to achieve the aim you have in view.

Though I find the young in the mass charming, I do not find them good company. For they take themselves with a seriousness which is only

unintentionally diverting. Humor is rooted in disillusion, and golden illusions press them around about. It is middle age that laughs, since it is difficult to laugh at the world until you have first learned to laugh at yourself.

So here are at least two good things that middle age gives you: the inestimable boon of freedom, and the precious gift of laugh¬ ter. What makes youth unhappy is its de¬ sire to be like everybody else: what makes middle age tolerable is its reconciliation with oneself.

But frankness well becomes the man who is no longer young: I would sooner be a fool of twenty-five than a philosopher of fifty.

{first published in VF in 1923}

Mathematics and Science

Bradley's 1725 Estimate of the Speed of Light by Patrick

The measurement of the speed of light is an undertaking that spans three hundred and fifty years back to 1675 and the work of the Danish astronomer Ole Roemer. Fifty years later the English astronomer James Bradley measured the aberration of light and interpreted this effect as being due to the finite time light takes to travel down the length of the telescope. While Roemer's measurement was done first, his results were rather imprecise, while those of James Bradley somewhat better. An estimate will be done for the speed of light using Bradley's 1725 measured aberration of light, from which and a value for c close to modern values is found.

The Aberration of Light

The earliest measurement of the speed of light was undertaken by the Danish astronomer Ole Roemer around 1675. Many students are introduced to his measurement when they study astronomy or physics. His estimate of 2.26 x 10^{8} m/s is about 25 % lower than the modern standard value for c.

Fifty years later, while attempting to measure parallax in stars James Bradley discovered the stellar aberration of light in 1725. [1] Bradley interpreted this effect as being due to the finite time light takes to travel down the length of the telescope while the Earth orbits the Sun (refer to Fig. 1: Stellar Aberration). [2]

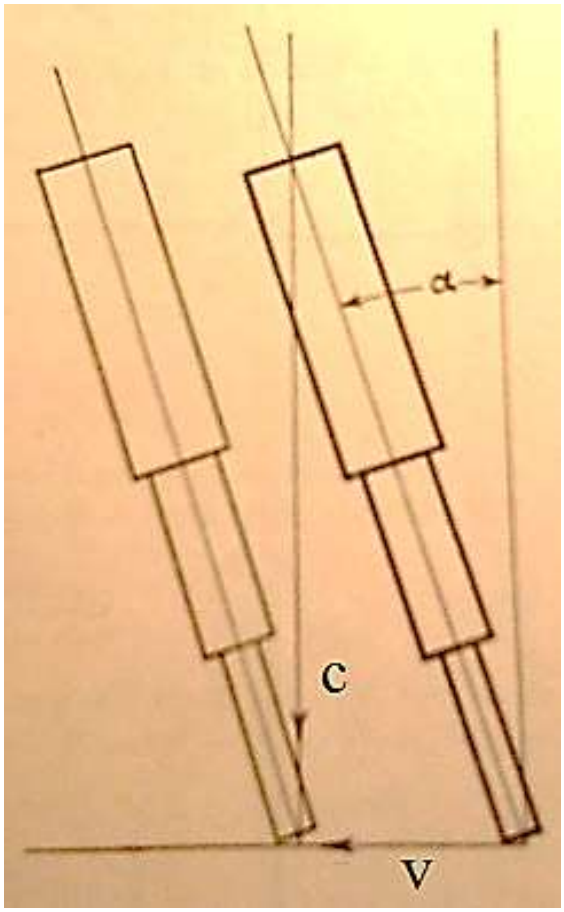


Fig. Stellar Aberration

Sometimes students are taught, in passing, about the discovery of stellar aberration by Bradley when they are studying optics or Special Relativity. Rarely is his measurement used to estimate the velocity of light in vacuum.

In terms of classical physics, by inspection the geometry is given by

$$\tan \alpha = \frac{v}{c}$$

where the speed of light is c, while the speed of the Earth around the Sun is v.

Estimating the Speed of Light using Stellar Aberration

The angle measured by Bradley for the north-south component of the stellar aberration for γ –Draconis was 41" of arc. We divide this value in two and convert to an angle, θ to arrive at

$$\theta = \frac{20.5\ "}{3600"} = 5.69\ x\ 10^{-3}$$

From whence we find

$$c = \frac{v}{\tan(5.69\ x\ 10^{-3})}$$

We can directly use the Earth's speed around the Sun of 29,783 m/s to arrive at an estimate for c of

$$c = \frac{29{,}783\ \text{m/s}}{\tan(5.69\ x\ 10^{-3})} = \frac{29{,}783\ \text{m/s}}{9.93\ x\ 10^{-5}} = 2.99\ x\ 10^{8} m/s$$

This estimate for the speed of light is both straightforward to make and is within 0.5 % of the modern standard value for c. In *Special Relativity* there is a second order correction to stellar aberration which will now be elucidated. [3]

Second Order Correction

A second order correction would be to take into account how Special Relativity modifies the classical dynamics of stellar aberration. By inspection we find that

$$\cos\theta' = \frac{\cos\theta + \beta}{1 + \beta\cos\theta} \cong (\cos\theta + \beta)(1 - \beta\cos\theta)$$

where β = v/c and the prime angle measurement is made in the moving frame.

Expanded out this becomes

$$\cos\theta' = \cos\theta\,(1 - \beta^2) + \beta\,\sin\theta$$

The angles are related such that

$$\alpha = \theta - \theta'$$

From trigonometry

$$\cos\theta' = \cos(\theta - \alpha) = \cos\theta\cos\alpha + \sin\theta\sin\alpha$$

By inspection then,

$$\sin\alpha = \beta$$

and

$$\cos\alpha = 1 - \beta^2$$

Which means then that to a second approximation

$$\tan\alpha = \frac{\beta}{1-\beta^2} \cong \beta\,(1+\beta^2)$$

This expression was analyzed using *Wolfram Alpha*. With the data from Bradley's measurement we find to four significant figures that the speed of light is

$$c = 2.996(7)\ x\ 10^8\ m/s$$

which is very close to the modern standard value of 2.9979 x 10^8 m/s. James Bradley's measurement provides us with a direct and precise means to estimate c.

References:

1) Bradley, J., Phil. Trans. Roy. Soc., 35, 637 (1729)

2) Bergmann, P.G., *Introduction to the Theory of Relativity*, Prentice Hall, 1942

3) French, A. P., *Special Relativity*, MIT, 1968, Chapter 5

Pictorial: The Modern Woman

Archimedes' Method of Exhaustion and the Volume of a Cone

by Patrick Bruskiewich

It surprises students studying Calculus for the first time to discover that the Calculus of Integration has its conceptual roots all the way back around the time of classical scientists like Archimedes. Sure we remember Archimedes for his "Eureka" moment, but there is much more to the man than just finding a means to demonstrate that the King's Crown was not made of pure gold …

Archimedes understood you can estimate the volume of simple shapes, such as a right cone, by stacking up thin cylinders and then you make the cylinders thinner and in greater numbers. Today we would call this 'taking the limit.' In Archimedes' time this would be known as the 'Method of Exhaustion.'

Mathematicians as a whole are rather disingenuous when they describe the approach outlined in this paper as a Riemann sum. The technique was presented millennia before Riemann was even born by Archimedes.

The radius as a function of height for a right cone of height H and base radius R is

$$R(h) = \left(R - \frac{R}{H}h\right)$$

The volume of a thin cylinder is

$$\Delta V(h) = \pi \left(R\,(h)\right)^2 \Delta\, h$$

The thickness is arrived at by dividing the height H in N equal parts such that

$$\Delta\, h = \frac{H}{N}$$

Combining these two equations we find that

$$\Delta V(n) = \pi R^2 \left(1 - \frac{n\,\Delta h}{H}\right)^2 \frac{H}{N} = \pi R^2 \frac{H}{N}\left(1 - 2\frac{n}{N} + \frac{n^2}{N^2}\right)$$

The total volume V is given by the sum of the volume of the thin cylinders, namely

$$V = \sum_{n=1}^{N} \Delta V(n)$$

In ancient times mathematicians had studied triangular numbers and square numbers which relates to the sum of simple groupings of numbers. Archimedes knew of these sums.

We find then that the volume of the stack of thin cylinders takes the form

$$V = \pi R^2 \frac{H}{N} \sum_{n=1}^{N}\left(1 - 2\frac{n}{N} + \frac{n^2}{N^2}\right)$$

By inspection we find that

$$V = \pi R^2 H \left(1 - \frac{2}{N^2}\sum_{n=1}^{N} n + \frac{1}{N^3}\sum_{n=1}^{N} n^2\right)$$

This can be simplified further using triangular and square number sums, so that

$$V = \pi R^2 H \left(1 - \frac{2}{N^2}\frac{N(N+1)}{2} + \frac{1}{N^3}\frac{N(N+1)(2N+1)}{6}\right)$$

We next consider what happens when we take N to a large number, such that

$$V = \pi R^2 H \left(1 - 1 + \frac{1}{3}\right)$$

It is interesting that the first two terms cancel each other out yielding

$$V = \frac{1}{3}\pi R^2 H$$

You might try your hand at using the Archimedean method to determine the volume of a sphere. You don't need integral calculus to do this calculation.

Poetry

Five Poems by Michael Strange

Fate

I am Fate,
The thrown back noose;
The lapse into unconsciousness;
The revitalized echo.
I peer from the faces of pools, at dusk,
From the up-flung eyes of praying women,
From the roar and flux of the eternal tides.
My direction speaks
In the curiosities of children,
Among the impulses of manhood,
And in the sympathies of age.
I drive all caravans
To their next resting;
I tune each instrument
For its latest song;
Since I comprise the gait
Of every purpose;
I, who am Fate,
The reins upon Time,
The inevitable way,
The brow of Destiny.

Why!

Why some down-flying bird
Shakes a slumbering rose;
Why a poet's muse—leads on—or goes,

God knows!

Why Love, juggling with gleams,
Should alight on your sill,
Singing to you—Fulfill, Fulfill,
'Til you rise, cry out—and find the air still.
Why Birth is launched amid shrieks and cries,
Why Life is spun from a thread of sighs,
Until Death sweeps up, on his flight of crows—

God knows!

Autumnal

To-night the inland sea hurls through the air
Her foam. The trees twist, silver-limbed and bare!
A new strength mutters in the wind, while
I—
I feel the nails of Time among my hair!

Solitude

I am Solitude,
The master of thought,
The mood of sorrow,
The whistler for dreams.
I dwell in the fixed look
Of sad eyes,
And in the questioning smile
The soul gives strangers.
I live in the phrase
That is never answered;
In the ultimate Why Of the cloistered heart.
I call my eleves
At the Autumn's moonrise;
And, during the Winter's
Snow-mad nights,
I sing to them
Of the loves of angels,
And the dying words
Of the passing Gods.
For I am Solitude,
The master of thought,
The mood of sorrow,
The whistler for dreams.

Sunset—An Impression

Columns of golden smoke,
Floating against aquamarine;
Ribbed mantles of purple rose,
Stretching across sapphire-musk;
Fissures—slate colored—
Expanding into white, and widening
Among greens. Reds!
Then wind-pulled, dust grey snow-fields,
Hardening to black.

{Footnote: No summary of Michael Strange's work can be counted complete without a reference to its most salient virtues and chief defects. By defects is meant, first, the occasional lack of form in her poems—perhaps the result of a contempt for technical metric formulae—-and, second, a somewhat too insistent introspection. To the latter defect we attribute a feeling, as we read her outpourings, of witnessing the tortures of an intellect whose subtleties have turned back upon itself. Her introspection is at times so complete that she seems as one employing a delphic alphabet, with the meaning of which she is, alone among mortals, familiar. In this she a little resembles the futurist painters, who express themselves in symbols which convey emotions that are poignant to them, but without definite meaning to others.

The virtues of Michael Strange’s work lie in the highly emotional qualities discernible in it: in the daring of her metaphors and similes, and in her power of evoking the true atmosphere of drama. She has, too, a decided gift for satire', a wit and cleverness of phrase which challenge our interest; an occasional, and charming, whimsicality; and always something of golden Youth, something intangible but none the less appealing.

So that, notwithstanding the lack of clarity in their outline and the morbid introspection often so evident in them, her poems are calculated to arrest the attention of a public long swamped by the ordinary "magazine" verse of our day, verse which, though irreproachable in form, is nevertheless wholly undistinguished in thought, in drama, or in emotion.}

Pictorial: Something Sapiasexual

"If you quote Rilke again, I'm just going to have to take my bra off!"

One Child Too Many ... by Patrick

Every journey starts ...
with a step, or two
then another, and another,
until you are either walking,
towards something,
or perhaps running,
away from something ...
    That is just the way
    that life is for most of us ...
We are after all
only human, frail creatures
who worry about small things,
and about large things too,
less often than small things ...
God only knows how
often I have journeyed forth
    Sometimes by choice ...
    most times against my will.
Take for the instance
the day my mother
rushed me out
of her womb ...
I wasn't ready you see ...
I did not want to leave,

from her warm belly,
life was so easy for me ...
Free room and board
with all the love I needed ...
But one spring day
life came knocking,
get out it said,
and push, push, push
then there I was immodest
hanging from my heels
in front of perfect strangers,
Wearings masks ... for shame!
Hide their faces away
and me I am in the unwrapped
in the best suit I will ever own.
Sure, make fun of me
That's why ...
I did not want to breathe
That's why ...
I did not want to live in your world
I was happy to live,
alone in my world
Warm and aqueous ...
Now you expect me
to fend for myself.
You saw that I was

another boy like your first
and so you thought you
might throw me back ...
        This was written
        all over your faces
I knew this so that's why
I did not want to breathe
You had to decide whether
to keep me ... then with
much reluctance you did
decide to wack me
on my backside with such ferocity
        that I took my tiny fist
        and punched you in the face,
and all you could do is laugh at me
and wack me
a second time
to see if I might
punch you again,
Ah free will!
instead I set out to cry
        After all ... who punishes an innocent
        new born who did not want to live
wasn't it enough
that I had to squeeze my way out
Sure don't make it easy for me

I remember it all
so clearly ...
as if it was just yesterday
small wonder
    Even today I can't
    remain in close quarters
with anything or anyone.
Today when you hug me
I know he mean well
but hell ...
don't hug me too tight
I might start to scream
and run around in circles
    and doft my clothes
    and cry out at the unfairness of life.
Even today ...
I remember you
peering down your nose at me
wrapped up warm and tight
in a blue blanket, set in my crib
surrounded by other crying creatures ...
in a sea of pink
    Me reading your lips and
    realizing that you had hoped
I would balance things out
A first boy ... then ... perhaps a girl

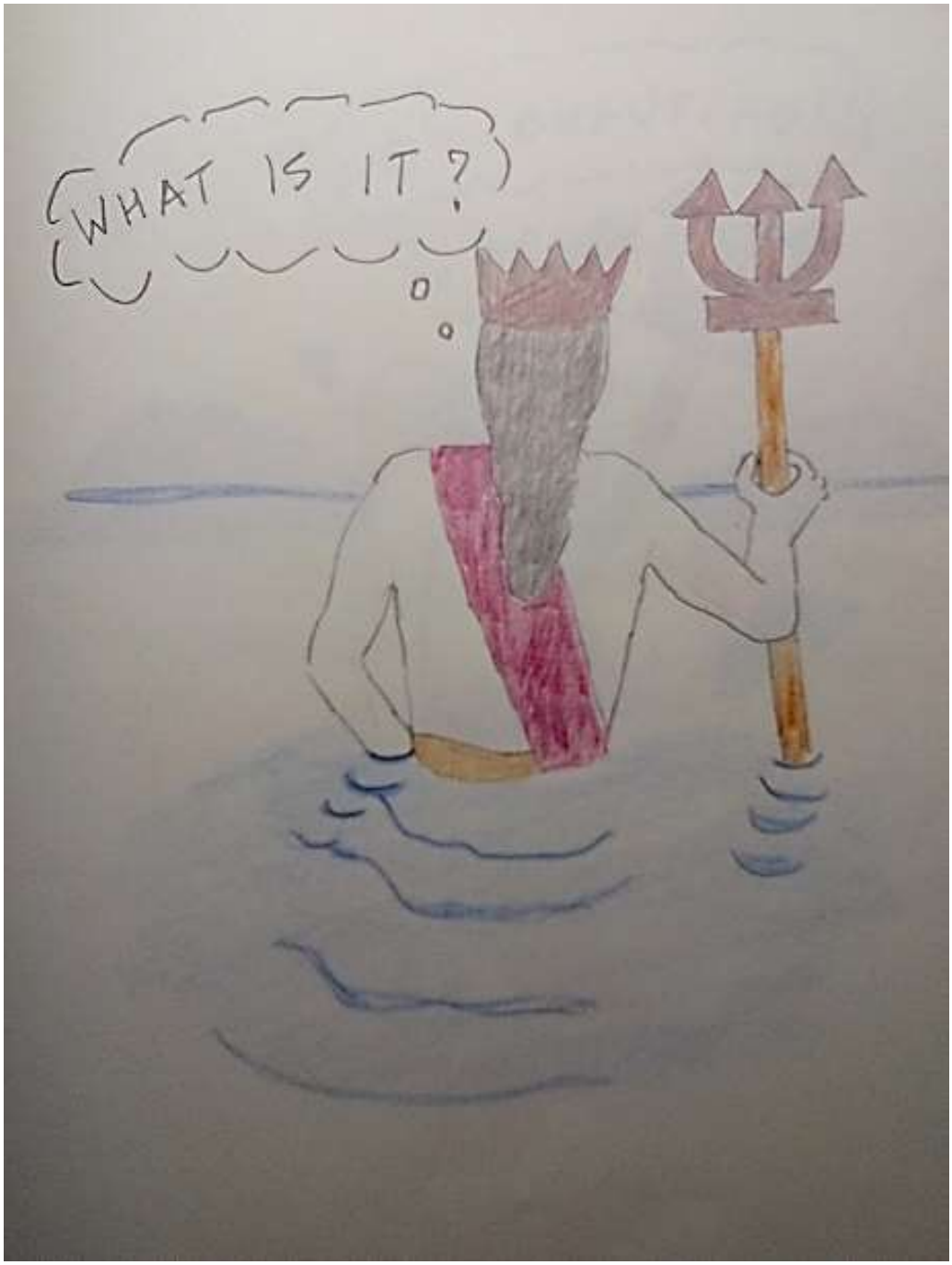
instead of two blue blankets ...
so you all but forgot me
and would have left me there
at the grand *Birthedral*
all alone and abandoned
    had the nurses not needed
    the crib for some other ... ‘bundle of joy.’
So you had to
take me home with you, after all
to set me next to your TV
like a stuffed toy ... a boy
and hoped no one would notice me
then you set out
to try once again
    third time lucky
    then left me to fend for myself
in your world ...
with one child too many.
It would have been
much easier for me
if you had just
left me nameless
in a basket
    at the door
    of the *Birthedral*...

Art

Poseidon's Pique by Patrick

Somewhere in the Aegean Sea Poseidon is All Alone on his Island.

OH MY!


WHAT IS IT?

SHE'S BEAUTIFUL!

I am no longer alone!

Hwa!
Hwa!
Hwa!

Shhhh

Z
Z
Z
Z
Z

OOOOOH!

OMG!
WOW!
Teke

GIGGLE
GIGGLE

(GIGGLE)
(GIGGLE)

Smooch!
Smooch!
(HELP!)
Smooch!

HAIL THE QUEEN!

O
M
G!

EMPTY OCEAN!
MAYDAY!

SIGH!
YES!

OH ME!
OH MY!
WAAH
WAAH
WAAH
WAAH
WAAH
WAAH
WAAH
WAAH

Pictorial: Why do woman artists draw men as eunuchs?

The Loin Cloth Scandal by Henry Adams

Throughout his life, Eakins was involved in feuds and quarrels. These often contained an element of conspiracy, with individuals shifting sides and plotting against one another. Because these scandals were so numerous and the charges against Eakins so serious, it becomes far-fetched to suppose that he was completely faultless and innocent. But if we simply take the role of prose-cuting attorney and seek to pin the blame on Eakins, we run the risk of over-simplifying and misrepresenting both his actions and his intentions. Eakins's contemporaries were clearly bewildered about both his behavior and his motivations, and seem to have shifted sides because they often found that their initial explanations for his actions did not hold up. In short, the first step toward understanding Eakins is to recognize that his behavior was truly puzzling and that something by no means simple or straightforward was taking place.

An understanding of Eakins is made difficult by the fact that his behavior touched on an area of life, namely sex, which most nineteenth-century Philadelphians did not like to discuss in public.' Moreover, the Victorian vocabulary for describing or analyzing sexual activity was quite limited. It was possible to judge whether sexual behavior was "moral" or "immoral," but all "immoral" sexual behavior tended to be grouped in a single category. The highly specific character of certain sexual aberrations and obsessions was not understood, and sexual motivations were not clearly distinguished. As a consequence of this fact, every accusation against Eakins needs to be weighed and analyzed carefully. On the one hand we can often fill in what was left

unsaid for reasons of prudery or embarrassment. On the other, we need to consider that many statements were probably misleading, since they were based on supposition about Eakins's motives rather than solid evidence. Eakins's contemporaries seem to have been confused about whether Eakins's behavior was "moral" or "immoral" because something about it did not make sense to them.

Reducing these conflicts to a linear narrative is not easy, since the episodes often overlap and run together. Later disputes would often raise issues and complaints from some previous one, which would then be replayed, often in a fashion slightly twisted from the first occurrence. In many instances the disturbances that Eakins created are not well documented, and consequently are susceptible to more than one explanation. But as we run through the various episodes, certain patterns recur. Indeed, events that are puzzling viewed by themselves, begin to make sense when we match them up with other similar incidents. To start with, it seems to me, the best approach for making sense of Eakins is not to cast judgment, but simply to look for patterns that repeat themselves. Given that none of the existing explanations seems satisfactory, even small details are worth attending to, since they may point toward a different way of viewing things. At the risk of being tedious or confusing, it is worth looking at these scandals in detail, going back to the primary sources.

Since the story has as many characters as a novel by Tolstoy, I have added a biographical key at the back of the book, which summarizes the lives of the key figures and clarifies their relationship to each other.

The best-known scandal of Eakins's career—his dismissal from the Pennsylvania Academy of the Fine Arts—is one of the least well documented. The directors of the Academy provided no explanation for their decision and left no report or transcript of the investigation of Eakins that they conducted. While he made occasional references to the episode, Eakins never made a detailed statement in his defense, either at the time of the firing or afterwards. The Bregler papers contain useful information about this event, but the references are often cryptic and for the most part made in connection with later controversies. When all the available evidence is assembled, however, we can piece together roughly what happened.

At the time the Bregler papers were acquired, Elizabeth Johns conjectured that they would demonstrate that Eakins was fired from the Pennsylvania Academy because of disputes over the curriculum he imposed and its excessively rigorous approach.' In fact, this guess could not have been more wrong. What the papers reveal instead is that the complaints against Eakins were bit-ter and personal, rather than professional, and that many of those who were closest to him, including members of his immediate family, had grave doubts about his moral character.

As has already been mentioned, Eakins was fired from the Pennsylvania Academy after undraping a male model in front of a class of female students. This precipitated complaints that led to his resignation about a month later. The classic account of Eakins's firing was given by Goodrich in four crisp sentences:

> A few proper females complained to the directors. A special committee was formed, which upon hearing both sides ruled that Eakins must exercise restrictions in posing the model, or resign. His reply was that he would remain only on condition that he was not hampered in his teaching. On February 13, 1886, his resignation was presented to the directors and accepted.?

Goodrich's summary remains the basis of most subsequent accounts, but every sentence of his paragraph is incorrect or misleading except the last phrase indicating that Eakins resigned, which did indeed occur. Goodrich implies that the directors of the Academy fired Eakins because of the loin cloth episode. In fact, the directors of the Academy initially came to Eakins's defense. At the time the first scandal broke, one trustee even told a journalist that the loin cloth matter was simply "a tempest in a teapot." It seems clear that something of a more serious nature surfaced shortly afterwards, and led the directors to reverse their earlier position. In other words, the loin cloth incident was significant only because it led to the disclosure of more serious problems.

Goodrich states that the attacks against Eakins came from a few prudish individuals. In his account of Eakins's resignation he reduces this group to "a few proper females," although elsewhere in his book he mentions that the opposition came from "a small group of Eakins's own staff and students." In fact, Eakins's entire teaching staff sided against him. His most vigorous enemy was his main teaching assistant and second-in-command, Thomas

Anshutz, but Anshutz was backed by the other instructors, James Kelly and Colin Campbell Cooper, as well as by the anatomy demonstrators, Mary Searle, Charlotte Connard, and Jesse Godley.' There is no evidence that any of these figures was a prude. The student body seems to have been about evenly divided between those who supported Eakins and those who advocated his ouster. The group advocating Eakins's ouster, however, included many of his most talented students, as well as members of his extended family. Among the members of this group were Alice Barber, one of his two most gifted female students, who went on to become a successful illustrator; his brother-in-law Frank Stevens; and Elizabeth Macdowell, the sister of Eakins's wife.

Goodrich and other writers have always implied that resistance to Eakins came from "proper Philadelphia society," and was led by individuals opposed to the use of nude models. This does not seem to have been the case. Eakins's opponents were artistic colleagues and former friends, most of whom accepted the use of nude models as a matter of course. Possibly personality factors contributed to the conflict. There is ample evidence that Eakins imposed his way on people, without much regard for their feelings. Even his nickname suggests a stubborn and authoritarian quality: his students knew him as "The Boss." Nonetheless, the extent of the opposition to Eakins, and the fact that this group was successful in persuading the directors to push Eakins out, strongly suggests that Eakins had done something either quite shocking or unarguably out of line with guidelines that had been laid down by the board.

Goodrich also implies that Eakins's resignation was a calculated moral decision—that he was given the choice of staying if he changed his manner

of teaching, but that he refused to do so. In fact, there is no evidence that Eakins was given the choice of retaining his post if he agreed to relinquish study of the nude model. On the contrary, the trustees were apparently so distressed by what their inquiry turned up that they insisted Eakins submit his resignation.

It appears that there were four general complaints. First, Eakins was undoubtedly criticized for his seemingly excessive emphasis on the nude. When he became director of the art school of the Academy, he eliminated all the courses in design, still-life painting and landscape. Except for training in perspective, every class in his program was devoted to some aspect of rendering the nude. While men and women worked separately from each other, he insisted on using models of both sexes for both male and female classes. This seems to have been considered particularly shocking for women, since in the nineteenth century most women led protected lives, within the confines of the home. As early as 1882, a certain R. S. (who seems to have been the mother of a student or prospective student) wrote to James Claghorn, the president of the Academy, to complain about the emphasis on the nude, which she felt was morally offensive. As she protested:

> Would you be willing … to know [your daughter] was sitting there with a dozen others, studying a nude figure, while the professor walked around criticizing the nudity, as to her roundness in this part, and swell of the muscles in another? That daughter at home had been shielded from every thought that might lead her young mind from the most rigid chastity. Her mother had never allowed her to see her young naked

> brothers, hardly her sisters after their babyhood & yet at the age of eighteen or nineteen, for the culture of high Art, she has entered a class where both male & female figures stood before her in their horrid nakedness. This is no imaginary picture.

This statement has often been used to vindicate Eakins, yet we can also read it as an assertion of the prevailing social norm in Philadelphia, where young girls might come to study art having never seen a naked figure, either male or female. While this letter has been widely ridiculed, it indicates how radically Eakins's procedures violated the social conventions of the times, at least for Philadelphia." No doubt the directors of the Academy were aware of this tension.

Nonetheless, Eakins's use of nude models, by itself, can hardly have led to his departure, for it was a recognized part of professional artistic training. Eakins's emphasis on the nude was already known to the board, and they had gone along with his curricular changes, although perhaps reluctantly. After Eakins's departure the teachers at the school continued to use nude models, just as they had when Eakins was director.

Second and more serious was student complaints that Eakins's behavior was often coarse. He employed crude language, was fond of dirty jokes, and often seemed to take delight in drawing attention to matters usually not discussed, such as male genitals and excrement. When dissecting male cadavers, for example, Eakins did not remove the penis, as was apparently the practice at the time. When he presented the cadaver to the class he not only exposed the

penis but also discussed his decision at great length. When discussing bodily functions he did not use polite euphemisms, but, as several students complained, made a point of loudly asking his female pupils if they needed to "pee." He also told dirty jokes, including one about plums that presumably dealt with diarrhea. Indeed, his fascination with anal matters was noted by several of his students. Around the time of the Eakins memorial exhibition, one student wrote a letter to Bryson Burroughs about Eakins's personality that contained the following story:

> One day in the woman's modeling class (they had a live cow as model) the cow started to answer a call of nature. Eakins was criticizing one of the young ladies and when he saw this he jumped up and fairly yelled to Anshutz. "Get the camera, Tommy, I have discovered a new muscle! You can imagine the effect. Eakins was full of stories and jokes.'

Surely some of Eakins's pupils must have been less than delighted by such emphasis on the anus of a defecating cow. This sort of behavior would be shocking today, let alone in a society that draped piano legs, so that they would not be seen in public undressed. Clearly this issue of coarse behavior represented a legitimate matter of concern.

However, issues of tone and propriety are open to wide variations of interpretation, and it was often a matter of dispute whether Eakins had been offensive or simply excessively frank. If this issue of verbal propriety had been the only matter raised against Eakins, it seems likely that he would have escaped with a reprimand, rather than insistence that he resign.

Third, and more serious, Eakins had defied the normal boundaries between student, instructor and model: he had pressured students to pose in the nude and he had taken his own clothes off in front of students. Many accounts indicate that he coaxed and badgered his female students to pose nude, whether or not they were willing to do so. When they resisted, he did not back off, but continued to pressure them to undress. He seems to have applied similar coercive tactics to his male students as well.

This practice stirred up a good deal of gossip, and stories about his behavior were still circulating fifty years later, when Goodrich began collecting material for his biography. In his 1933 monograph, Goodrich mentioned one such incident:

> Once when a model in the women's class had not appeared, and he was explaining an anatomical point about the female back, he asked one of the young ladies to take off her clothes so that they could see her back; but instead she burst into tears and went home, and told her father, who caused a com-motion which was with difficulty smoothed over.

As so often happens with Goodrich's accounts, the episode is reported in a way that seems to justify Eakins's behavior but is evasive about key points. Thus, Goodrich implies that Eakins was acting from necessity, but does not specify whether the model was just a few minutes late or completely failed to appear. He also does not clarify a key point, that is, whether Eakins asked the

young woman to undress completely or simply to show her back. The one thing that we know for sure is that the student was distressed by his behavior.

Goodrich was also told about a young woman who had an unusual talent for catching a likeness. Supposedly, she carelessly left her sketchbook of drawings of naked fellow students in the classroom, where it was found by the incoming men's class, to their scandal and enjoyment. As Goodrich notes, this story has the quality of a fiction.'? Nonetheless, it may contain at least a grain of truth, since in one of his letters Eakins himself blamed a female student for the circulation of the names of his models. With characteristically awkward grammar and poor punctuation he noted:

> One of the women pupils, some years ago gave to her lover who communicated it to Mr. Frank Stephens a list of these pupils [who had posed in the nude] as far as she knew them.

While Eakins does not provide the name of this female pupil, he was probably referring to Alice Barber, one of his most talented students, who became a successful illustrator. Alice Barber married Charles Stephens, who played a major role in the campaign against Eakins, and she was undoubtedly a key source for the stories that Stephens circulated. In fact, Barber seems to have suffered from malicious gossip because she had posed nude. As Eakins's sister Frances recalled in 1890, four years after he was fired:

> Take Alice Barber, for instance. Her crime was having posed for her professor, yet when discovered her name was made subject of coarse jest among low New York students.

Eakins also had undressed in front of his students. It is unclear exactly what the directors of the Academy discovered during their inquiry, but eight months after Eakins was fired, in September 1886, Eakins freely admitted to Edward Horner Coates, the president of the board, that he had invited one of his female students, Amelia Van Buren, to come to his studio so that he could explain an anatomical point about the pelvis. "There stripping myself, I gave her the explanation as I could not have done by words only.

In addition to the somewhat fragmentary written evidence, we also have another form of testimony—Eakins's own photographs. Around 1976 a group of twenty-one prints, most of them of nudes, were discovered in the safe deposit box of Edward Coates. Evidently he had confiscated them at the time of the Academy scandal, both as evidence and to prevent them from falling into the wrong hands. Additional photographs have also surfaced in other places, including many in the Bregler collection. While we do not have Coates's letter, Eakins later mentioned that Coates had complained that

Eakins "had made photographs of female pupils naked," so there can be little doubt that this issue surfaced at this time. … But two points should be mentioned: first, many of these photographs portray students who are nude, often in full frontal nudity; and second, many of these photographs contain indications that the models were not comfortable, such as averted gazes or

other signs of embarrassment. The photographs thus appear to confirm what is indicated in written accounts—that Eakins's students posed in the nude for him, and that some were reluctant but complied because of intense pressure or coercion from their teacher. In his teaching and demonstrations of anatomy, Eakins also regularly placed his hands on the model, which must have made his breach of the usual standards of decorum even more distressing.

Male Nude Sitting on Modeling Stand, Holding Small Sculpture of Horse, in Pennsylvania Academy Studio, ca. 1885. *Albumen print, 3 15/16 × 4 3/4 in., courtesy of The Pennsylvania Academy of the Fine Arts, Philadelphia, Charles Bregler's Thomas Eakins Collection, purchased with the partial support of the Pew Memorial Trust.*

Photographs of Eakins himself in the nude have also come to light. These fall into two categories. A first group shows Eakins standing nude in front, back, and side views. These shots were allegedly taken to demonstrate some-thing about human posture. A second group shows him standing beside a nude woman or carrying this woman in his arms. It is not clear what purpose this second group served. Taken together, the photographs securely document

both that Eakins posed his students in the nude and that he himself undressed in front of them.

Female Nude Sitting on Queen Anne Chair, ca. 1885. *Platinum print, 4 15/16 x 3 in., courtesy of The Pennsylvania Academy of the Fine Arts, Philadelphia, Charles Bregler's Thomas Eakins Collection, purchased with the partial support of the Pew Memorial Trust.*

This charge of using students as models was surely the most damaging of the allegations against Eakins, and the photographs that Coates collected left no doubt that this charge was true. For one thing, the board had specifically requested that Eakins not engage in this practice. Thus, in purely legalistic terms, they were justified in firing him for failing to obey their directives. In addition, such conduct clearly went against normal artistic practice and the customary professional standards of artists and art schools. Many American and European art teachers used nude models, but they allowed their students to retain their clothes, indeed, insisted that they do so. The fact that Eakins

had also undressed in front of his students surely added significantly to the case against him. Although Eakins maintained that his reasons were "*professional*," there was no professional precedent, either in Europe or America, for such a practice.

African-American Girl Nude, Reclining on Couch, ca. 1882. *Albumen print, 1 7/16 x 2 7/16 in., courtesy of The Pennsylvania Academy of the Fine Arts, Philadelphia, Charles Bregler's Thomas Eakins Collection, purchased with the partial support of the Pew Memorial Trust.* Eakins photographed not only naked adults but children as well. LEFT *Three Female Nudes, Pennsylvania Academy of the Fine Arts, ca. 1883, albumen print, 5 x 3 5/8 in., Founders Society Purchase, Robert H. Tannahill Foundation Fund, photograph © 1984 The Detroit Institute of Arts.* This photograph confiscated by Edward Coates showed three female students posing nude in a classroom at The Pennsylvania Academy.

The fourth and final accusation was that Eakins had engaged in sexual misconduct, including not only improper advances on students, but more shocking practices, including sodomy, bestiality, and incest. Such stories were apparently still circulating about Eakins at the time that Goodrich began his research, although because of Goodrich's circumspection we will probably never know what they were. With his usual tendency to dismiss evidence that did not place Bakins in a favorable light, Goodrich noted, "Another conservative pupil told wilder tales, which were made unreliable by his inaccuracy in other matters.

Since the witnesses against Eakins testified behind closed doors, and no record of their statements was made, we do not know specifically what charges were made against him at the time of the Academy scandal. Shortly afterwards, however, public allegations about Eakins's misbehaviour began to surface. Eakins's brother-in-law, Frank Stephens, was particularly active in pushing forward charges of sexual misconduct, and he was supported by other witnesses, such as Alice Barber and Thomas Anshutz.

Such charges of sexual immorality surely must have been disturbing to the directors of the Academy, who were concerned about the school's good reputation. Yet these charges were difficult to prove and in many cases may have appeared implausible. In fact, one of the arguments frequently raised in Eakins's defense was that there was no solid evidence (such as an illegitimate child, an estranged mistress, or a clear accusation of rape) that he had ever seduced a female student. He himself maintained that his motives were purely professional in nature. In short, while Eakins's behavior toward students clearly violated normal social boundaries and art school practices, his motives were far from clear.

Paradoxically, the scandalous nature of Eakins's behavior provided him with protection, since neither the students involved nor the directors of the Academy wished these matters to be widely known. Female students were naturally embarrassed that they had been pressured into posing in the nude, while the Academy did not wish it to be publicly revealed that such activities had occurred. As a consequence, during the inquiry into Eakins's activities,

students made their accusations orally rather than in writing, and the Academy did not preserve its report on their investigation, if indeed it was ever written. When the Academy dismissed Eakins, it gave no reasons other beyond a general need for "a change of management of the school."

Newspaper articles of the time also used evasive language to describe what happened, although they hinted at something scandalous. Thus, for example, an article in the Philadelphia Evening Bulletin stated:

> With a few abnormal exceptions the women at the Life School recognized the fact that much as they might risk in coming in conflict with the Academy authorities, they would risk infinitely more by accepting the conditions that Mr. Eakins proposed to force upon them.

The phrasing of the article strongly suggests that the writer knew that Eakins had pressured his students to undress, but significantly, he alluded to this through discrete hints rather than direct statements. While Eakins's troubles have generally been blamed on Victorian prudery, his behavior would be considered even more inappropriate today. The Victorians had only vague standards of "morality" and "proper conduct" with which to regulate Eakins, and they tended to support male authority. Today we have a legal concept—sexual harassment—that could be applied against him, and a long series of legal precedents defining the nature of such behavior. In today's world, Eakins would not only be fired, but would be subject to lawsuits by the women he pressured to undress. Thus, for example, Anne McCauley has noted of Eakins:

> His reported loose language and telling of off-color stories to his female students (to say nothing of the famous episode of dropping his trousers to make an anatomical point) could by modern standards be considered sexual harassment.

Surprisingly, opposition to Eakins did not end when he was dismissed. Instead, it simply moved on to other arenas, where the conflict simmered on for the remainder of Eakins's life. The ensuing feuds and conflicts were so numerous, and such a mix of public and private, that it is difficult to reduce them to a linear narrative. But what is most startling about the revelations of the Bregler papers is that they show that much of the opposition to Eakins came not from professional colleagues, but from within his own family. At the risk of oversimplification, it is convenient to divide this thirty-year war into two major battles, the first setting Eakins against his youngest sister Caroline and her husband Frank Stephens, and the other pitting Eakins against his only other surviving sister, Frances, and her husband, Will Crowell. Siblings, in-laws, cousins, pupils, and acquaintances were progressively drawn into both conflicts, creating a mud-slinging melee of accusations and recriminations.

Novella: Living in the Realm of Ideas

by Patrick Bruskiewich

Prologia

Were you expecting the vulgar term *Prologue*, or its Latin root *Prologis*? If we are a scholar, we have the right to make up our own words, provided their meaning is understood. Obviously this is the beginning of our *Discourse* … hence *Prologia*. You don't have to be a Chomsky to appreciate language and information …

We all know that our lives are brief and somewhat meaningless. We toil and strive hoping to find purpose in our lives. Some find meaning through the accumulation of material wants, while others find meaning through the exploration of ideas.

When we reach a certain age, which I have reached and then some, we ponder about what we may leave behind as our legacy once we have shuffled off our mortal toils. As expressed by a twentieth century philosopher …

> *Measured objectively, what a man can wrestle from Truth by passionate striving is utterly infinitesimal. But the striving frees us from the bonds of the self and makes us comrades of those who are the best and the greatest.*

My legacy is indeed infinitesimal. My legacy may not be things or offspring. When I expire my meager legacy may only be some of my ideas. I don't have

a family, was once married but have long since been divorced. I have not remarried and have not fathered any children, although it had been one of my hopes. I am estranged from my immediate family because of our different world views (they are materialists, while I prefer ideas) and so there have been times when I have wanted to change my name and make a clean slate of things.

I was close to my mother and carry her creative sensibilities. She was a French teacher, from Montreal, an artist, and a casual acquaintance of Pablo Picasso (as an artist mind you …) But my mother is now gone and I am alone with nothing more than a circle of casual acquaintances and the ideas that bounce around in my head.

Some of these ideas are novel while some are borrowed or abridged. Perhaps this is where we might start our *Sermos des Notiones* … our *Discourse on ideas*. By the way the twentieth century philosopher was … Albert Einstein.

When I was a teenager and wondering what I might do with my life I was enticed into the world of ideas by my reading of both the life and works of Albert Einstein. I could relate to him as a person, but what was most interesting is that he could sit and think for himself and come up with the most remarkable ideas with nothing more than a penchant for physics and mathematics, and pen and a piece of paper.

At a young age I felt that such a mathematican's bohemian life was for me! It is an independent life where you try to understand the universe through physics and mathematics. This meant that I had to understand pure and

abstract mathematics, which I think I do, to the extent I can understand and characterize the phenomenon we experience around us. Mathematics is not an easy subject to master and it is only for the dedicated. In a real sense physicists like Albert Einstein are the monks of Modernity.

I agree with Einstein in that Mathematics is both external to our existence, and eternal in nature. He was quite a romantic when it came to mathematics …

"Pure mathematics is in its way, the poetry of logical ideas."

Nature can be described in many ways, but in no way so grand as through the use of mathematics. And when we accept that we may also eventually accept that we are not more important in the grand scheme of the universe than a bird that flies overhead or any other living creature for that matter, even an ant crawling at our feet. If we accept this then perhaps we can appreciate what it means to think and to have worthy ideas. And if you feel this thought to be without merit I invite you to try to fly without an airccraft, or make a machine as autonomous and remarkable as an ant. You can't can you?

Who invented the term mathematics? It was Pythagoras who over a millennia ago, when he was asked by the hordes why they should bother with numbers, he replied *Mathematicos*, it was something worth learning! Perhaps you also know that it was Pythagoras who came up with this description of himself … "I love knowledge, hence I am a *Philosopher* … "

Are you a Natural Philosopher (aka a scientist)? Do you study mathematics? Can you think like Pythagoras? Perhaps you can to some extend because you remember right triangles, the sine law and the cosine law. Geometry may not have been your forté at school.

Do you know how Archimedes measured the area of a circle – the easy way? He took a circle of radius R, rolled it along to get circumference $2\pi R$ then convinced himself that the area of the circle was in fact the area of the triangle he had made, namely Area = $1/2\ (2\pi R)\ R = \pi R^2$. Isn't that beautiful!

I cannot think of more straightforward and sublime derivation of the area of a circle, unless you consider Sir Isaac Newton's use of Archimedes' idea in his rendering of circular area using Integral Calculus. One idea led to the other …

You might ask were we would be today if the ancient scholars like *Pythagoras* and *Archimedes* had not be so easily pushed aside in the midst of other lesser historical figures. Carl Sagan in his remarkable book and television series *Cosmos* speculated that humanity would now be travelling to the stars aboard ships bearing their names.

Why have these great ideas been pushed aside? You should look in a mirror. It is one thing to say you have read Rousseau, Descartes, Nietzsche or Chomsky. Ah, but can you think like Pythagoras, Archimedes or Albert Einstein? In terms of our contemporary age, do you understand Einstein's

physics and philosophy? Rousseau, Descartes, Nietzsche or Chomsky are for the undeveloped thinkers amongst you.

Do you really believe these other pedantic philosophers hold more merit than the likes of Pythagoras, Archimedes or Albert Einstein? Let me take you to task on this.

What Jean Jacque Rousseau, '*Citizen of Geneva*' presented as his 18th views were in fact a reflection of Christian virtue as expressed by a pragmatic Swiss society, a philosophy that both predated him, and existed separate from him. Anyone who appreciates this virtue can say that Rousseau to a degree pays tribute to this virtuous and pragmatic Swiss society. Rousseau is not alone in thinking in this fashion. Were it not for the free thinkers in Geneva it is highly unlikely Rousseau would have ever seen his name in print, let alone his words. Even today, by virtue of their commitment to informed consent Switzerland is a country with a strong democracy, a high standard of living and a high measure of individual freedom and contentment.

In a real sense Rousseau was expressing the spirit of his Protestant times and his *Genevan* place, ideas that preceded and existed outside of his personal sensibilities. You need to realize that the Swiss made Rousseau and not the other way around!

In all fairness philosophers like Descartes, Nietzsche or Chomsky are also the products of their experiences, their time and place. There is very little that is novel in what they have professed. It might take you some time to accept this.

Where did Albert Einstein find solace as a thinker in his formative years as a scientist but in a free and open Switzerland, working as a Patent Clerk in Zurich? It was at his clerk's desk that he had his *Annus Mirabilis* … publishing four papers in 1905 that changed the world! Even his *Gedankenexperimente* (thought experiment) was a method taught to him by a Swiss high school instructor. His ideas are incredible!

When it comes to the kinematic equations for Special Relativity, can you stand and derive an expression for mass dilation in thirty words or less. Well I can, and it has taken half a lifetime to achieve this. I have read enough Rousseau, Descartes, Nietzsche or Chomsky to move onto more pertinent thinkers. Modernity requires the reading of modern thinkers like Einstein, Planck, Heisenberg, Dirac and Feynman.

So what you say? Well, if you cannot understand '*the what'* then the rest of this *Discourse* is really not for you is it. You are perhaps stuck in the past. I want you to look forward into the 21st century and beyond.

Instead, perhaps you want to look back and wax poetic about Rousseau, think naively that Rene Descartes was a fine philosopher or that Nietzsche is worth quoting, and that Chomsky is to be taken seriously. Don't forget that Nietzsche was the favorite philosopher of Oswald Spengler, the Nazis, and political apologists like Paul Feyerabend who was himself a Nazis. Perhaps you are even attracted to the grunge judgements of Chomsky which are a product of the Vietnam War and Watergate.

Compared to the wisdoms of Pythagoras, Archimedes or Albert Einstein, the politics of Nietzsche and Chomsky are *Pop Corn* in so many ways and measures. There are other academics who fit this bill as well, such as Rene Descartes. Rousseau I will admit has some practical value.

A few years ago I wrote a book about Pierre de Fermat in which I commented on the absurd disrespect that Descartes had towards Pierre de Fermat, who is considered one of the fathers of modern mathematics and to infinitesimal calculus. I received some rather acidic emails from several French mathematicians when I suggested the *Folium of Descartes* should perhaps be renamed as the *Folium of Fermat*, for it was Fermat who answered Descartes' challenged and found the slope of the curve

$$x^3 + y^3 = 6 \text{ x } y$$

at the point x = y.

When Fermat, after just a few minutes of effort, provided the answer and wrote back to Descartes, Descartes was so incensed that history has it that he challenged Fermat to a duel. In short order Descartes was invited to leave France or face arrest and imprisonment – his was hardly the actions of a sane and rational man!

Can you find the slope of this expression (it is not a function for it fails the vertical line test) at the two points y = x (two you say!). Can you understand why this curve should be called the *Folium of Fermat?*

Descartes was always eager to claim other people's achievements as his own. For instance when Fermat borrowed the nautical idea of charts to plot curves, Descartes declared he had invented the mapping technique we now call Cartesian. Such nonsense! For what is a French map called but *une Carte*, onto which European navigators were keen to plot their longitude and latitude. When we plot x and y on a Cartesian plot we are plotting longitude and latitude … as if on a nautical chart.

Have you heard the story of the *philosophum porcum* … I stink therefore I am? I share this joke whenever people talk about their admiration for Descartes.

Even in astronomy there are remnants of his silly speculations, his nebulous nebula.

In modern times I have presented a *Two Parameter Turbulence Model* to explain planetary and exoplanetary formation. In undertaking this Modern Astrophysics I have swept away Descartes's nebulous thinking about how planetary systems are formed through the perplexing formation of rotating gas clouds. Circular motion is not natural motion. Sure we have rotating stars, galaxies and exoplanetary systems but we also have the grand radial expansion of the Universe as a whole. Not all galaxies form pin wheels do

they, approximately half do not. If circular motion was the norm than all galaxies would form spirals.

If you study fluid flow you understand how linear motion is sometimes translated into circular motion in some situations. The onset of turbulence leads to non-linear flow fields.

We in fact see this in the formation of planetary and exoplanetary systems. In my *Two Parameter Turbulence Model* interstellar gas falls onto the rotating surface of the parent star and then flows outwards until turbulence forms bands of density that with the passage of time coalesce into planets. The angular momentum of these bands of density take from the central star most of the central star's angular moment. The two parameters are the radius of the central star and the Reynold's Number for a particular material's turbulent onset.

In our solar system moving from the Sun outwards there are five broad categories of planetary types – the terrestrial, the asteroidals, the gas giants, the icy giants and the Kuiper belt *planetesimal* (some of which become comets). They are all joined phenomenologically to a common beginning and a mechanism of their formation.

My *Two Parameter Turbulence Model* is given by the derived expression

$$D = \left(\frac{Re}{32} + 1\right) * (0.9) * R_{Sun}$$

where Re is the Reynold's Number for a particular planetary type, R_{Sun} is the present radius of the Sun, while the factor 0.9 is to correct for the smaller radius of the Sun during planetary formation.

In a series of papers I derived the *Two Parameter Turbulence Model* and characterized the five types of planets in the Solar System. The values for the Reynold's Numbers for the Four Planetary Types in our Solar System are outlined in Table 1:

Planet	**Reynold's Number**	**Distance (A.U.)**
Mercury	3,500	0.465
Asteroid	19,600	2.6
Jupiter	40,000	5.2
Uranus	147,000	19.4
Comets	~ 300,000	~ 40

Table. 1 Reynold's Numbers and Distances for the Five Planetary Types

The noted distance on 0.465 A.U. for Mercury is the planet's aphelion distance for its eccentric orbit. The planet Mercury has a highly eccentric orbit.

When applied to our solar system it provides an *a priori* prediction of the distances and explains the location of Mercury, the asteroid belt object Vesta,

the gas giant Jupiter and the ice giant Uranus. By *a priori* it is understood the Reynold's number was predicted and the distances estimated and not the other way around. If the distance was used to estimate the Reynold's number that would be an *a posteriori* hypothesis and useless as a scientific model. We can fit any set of data if we are clever, this is *a posteriori*. It is a different matter if you hypothesis a relationship and then use *a priori* predictions to see how well the model fits reality.

As an comparative example, when you study Einstein's Theory of General Relativity you realize that while the bending of light by the Sun (as well as the advancement of the perihelion of Mercury) were known prior to 1916, it was in the advancing of a self-consistent set of ideas and a good mathematical foundation that allowed Einstein to assert that his Theory of General Relativity was consistent with what was measured in the bending of light (and the advancement of Mercury's perihelion). In the case of the bending of light, the prediction based on Newtonian physics was half that which was measured in 1919 by Eddington, while Einstein's prediction was within the uncertainty of the measured results, and twice those as predicted by Newtonian Physics. What Einstein's Theory outlined as values for the bending of light (and the advancement of the perihelion) were both *a priori* prediction.

I want you to understand that in my *Two Parameter Turbulence Model* it was only after I had derived the algorithm that I had made assumptions about the Reynold's number for the four types of planetary objects in our solar system.

The first assumption was that the flow for Mercury would be pyroclastic and hence Re = 3,500 for Mercury. This provided a tangible result consistent with observation.

Then there was a four month hiatus while I studied the onset of turbulence for gas flow through a Venturi that I predicted a Reynold's Number of 40,000 for Jupiter. This gives a distance that is within 2 % of Jupiter's distance from the Sun. The venturi would be the asteroid belt.

I then studied the correlation between density and Reynold's number for these two planetary types (Terrestrial and Gas Giant). Using this correlation I used a presumed density for Vesta (slightly higher than frozen water) to estimate a Reynold's Number for an asteroidal object, arriving at 19,600 for Vesta. This provided me the distance of Vesta from the Sun within a high accuracy.

There was a hiatus of two years when one day I had the insight to hypothesize a Reynold's Number for Uranus. With a density of 620 kg / m^3 for methane or ammonium at cold, space like conditions, I estimated a Reynold's number of 147,000 from which I derived the distance for the first of the Icy Giants to within a high accuracy. In doing this estimation I used an obscure NASA article from decades back to find the density of methane or ammonium at cold, space like conditions.

An assumption that follows from my *Two Parameter Turbulence Model* is that comets whic, are objects that originate further out from the Sun than Uranus (Kuiper belt *planetesimal*), would have densities less than 620 kg /

m^3. This is in fact what is seen in comets (Halley's comet has a density of 600 kg / m^3 and the object 19P/ Borelly which has a measured density of 300 kg / m^3.

My *Two Parameter Turbulence Model* predicts that the terrestrial planets would have different profiles of heavy elements that relate to elemental densities. The denser elements would be on Mercury and Venus, the less dense here in Earth and on Mars. In a paper a few years ago I hypothesized that within Venus may be found a considerable amount of uranium and thorium which has gone supercritical to not only generate huge internal amounts of heat energy but may have disrupted the core of the planet and therefore any Venutian magnetosphere the planet once had. If we want to mine for gold and other precious or rare earth metals we may in fact be on the wrong planet. NASA intends to send a space probe to Venus to float in the atmosphere and search for evidence that the inside of Venus was once, or may still be, a giant nuclear reactor. They will also do more thorough elemental assays.

My *Two Parameter Turbulence Model* not only explains planetary and exoplanetary formation, it explains the Bode-Titius Law of Planetary distances, a law that was discovered in the time of Jean Jacques Rousseau but was not understood until my explanation of a handful of years ago. That is a period of around three hundred years! My *Two Parameter Turbulence Model* explains not merely the planetary distances within our solar system, but for a number of interesting systems such as the Trappist-7 exoplanetary system.

My *Two Parameter Turbulence Model* not only explains planetary and exoplanetary formation, it also explains away the *Angular Momentum Paradox*:

> *Why is it that the Sun is 99.99% of the mass of the solar system yet only retains 4 % of the total angular momentum of all objects in the solar system?*

This paradox has been known since 1884, around the times of Hegel and Marx, and was not understood until my explanation of a handful of years ago. That is a period of one hundred and forty years!

This is Occam's Razor, a philosophical idea that a scientific hypothesis, along with being consistent with experiment and observation, explains the maximum possible realm of phenomenon with the minimum of complexity.

Science is not merely about dispassionate thought. Many times the passions of the scientist shows through. If you did not know this, one of the reasons why Sir Isaac Newton stated *Hypothese non Fingo* (I make no conjectures) in his 1713 edition of his *Principia*, was to give followers of Descartes 'the fingo' … as a response to Rene Descarte's asinine and silly metaphysical speculations.

Frankly, I am astonished that Descartes is still taught in philosophy classes. Descartes preceded Newton by half a life time, yet the simplicities of

Descartes lingered on well past the age of Newton, particularly among French Philosophers.

The title of Sir Isaac Newton's remarkable 17th century book says it all *Philosophiæ Naturalis Principia Mathematica* literally means *Natural Philosophy* (science) by means of *Mathematical Principles* (I bet you have never opened *Principia* to take a look see!) When 18th century Continental physicists and mathematicians realized why the Englishman Newton had stated *Hypothese non Fingo*, they tried hard to erase the ignominy of *Descartianism* and did 'one up' on Newton by reformulating his kinematics and dynamics not in terms of *infinitesimal Calculus*, but in terms of *Integral Calculus* (e.g. the Lagrangian technique). It was an act of contrition.

Incidentally the term *Descartianism* is of my making to replace the misnomer *Cartianism* which is *le voleur des idees* posthumously laying claim to Cartesian coordinates in mathematics.

Lagrangian's formulation is the nail in Descartes's coffin. In Lagrangian formulation, Pierre de Fermat's *Principle of Least Time*, which describes the motion of light from one point to another, is formulated as a general principle of Kinematics and Dynamics through what has now become known as the *Calculus of Variance*. The *Calculus of Variance* principle would see fundamental application not just in Optics but in Quantum Physics as well. In explaining what light is, during the seventy-five year period from 1875 to 1925, the modern scientific age would be born.

And what about Frederick Nietzsche? Why read Nietzsche when you can read *The Prince* by the Florentine Niccolo Machiavelli? This way you *cut to the chase*. Nietzsche's views led to Oswald Spengler, the rise of German nationalism and a sense of *Manifest Destiny* and well … we all know where what that lead to don't we – to Death Camps like Auschwitz and the extermination of millions during the Second World War.

In contrast to Nietzsche we have Albert Einstein, and his views as a humanist and a Pacifist. In a letter to a student at Rutgers University in December 1950, he outlined this utilitarian view to the student's question about life's purpose:

> *"… it is indeed very reasonable and important to ask ourselves how we should try to conduct our lives. The answer is, in my opinion: satisfaction of the desires and needs of all, as far as this can be achieved, and achievement of harmony and beauty in human relationships. This presupposes a good deal of conscious thought and of self-education."*

This is a plea for a compassionate society that you do not find in Nietzsche's writings.

During the same time period of the life of Nietzsche, Germany saw the likes of Gustav Kirchhoff, who I imagine is someone you have never heard of. He was the greatest Germany physicist and mathematician of the 19th century, and was to his century who Einstein was to the 20th. Gustav Kirchhoff contributed to our fundamental understanding of electrical circuits, to the

science of spectroscopy, and to an understanding of the emission of black-body radiation by heated objects, just to name a few of his contributions to science. In 1860 Kirchhoff coined the term Black-Body Radiation and showed that at a fixed temperature the rate of absorption is equal to the rate of emission. As a chemist Kirchhoff also discovered the elements Rubidium and Caesium which in our times play important roles in atomic clocks.

You may remember that you studied Kirchhoff's Circuit Laws in school:

> ***Kirchhoff's First Circuit Law****: The algebraic sum of currents in a network of conductors meeting at a point is zero.*
>
> ***Kirchhoff's First Circuit Law:*** *The directed sum of the voltages around any closed loop is zero.*

If you don't remember Kirchhoff's Circuit Laws, perhaps you remember working with batteries, with amp and Volt meters and with resistors in series and in parallel? Or perhaps Ohm's Law rings a bell in the back of your mind? The many electrical machines you take for granted, from cell phones to computers, run by the circuit rules set out by Kirchhoff a century and a half ago.

If you have you have studied *Black-Body Radiation* you have also heard of Max Planck. Kirchhoff, Planck and Einstein together explained the relationship between the spectrum emitted by a radiant object and the spectrum of the radiation. In 1900 it was Max Planck who derived the

spectrum of *Black-Body Radiation*, where others before him had failed, by using the concept of discrete quanta of light energy.

Then Einstein took up the challenge of explaining the spectrum, leading to an appreciation that it is a dynamic equilibrium, which along with absorption includes both spontaneous and *stimulated* emission of light within a *Black-Body Radiation Hohlraum*. We shall touch on the matter of *stimulated* emission of light further on in this *Discourse*.

In the 19th century, what Gustav Kirchhoff provided the world made for scientific and technological progress, leading ultimately to *Modernity*. The list of his accomplishments is as long as your arm. If you wasted your time reading Nietzsche, at this point in the great *Game of Modernity* … 'you don't pass go and don't get to collect two hundred dollars.' In contrast, what did Nietzsche's *Geist* instigate but death and destruction? Gustav Kirchhoff legacy is more valuable and uplifting.

One could describe Nietzsche as well as many of his contemporaries such as Hegel and Marx, as *obsessives*. In modern times we have had to deal with present-day *obsessives* like Chomsky. Noam Chomsky is an obsessive amongst academics and anarchists who feel that everything needs to be pushed over or analyzed critically. Just like Hegel and Marx are the opiate of the lazy intellect, so is the grunge writing of Chomsky. In a real sense Chomsky's condescension is the *obsessive's* version of *the pot calling the kettle black*.

I have already presented the view that there are two type of people you will meet in the world, those who are part of the problem, and those who are part of the solution of the problems that confront us. I ask again, which of the two types are you?

Be honest now … *obsessives* like Noam Chomsky are part of the problem, and if you walk in his footsteps so are you. He started out as an anarchist and then wrapped himself in sheep's clothing. If you declare Chomsky the father of cognitive science then I asked you if you know who C. E. Shannon was or Alan Turing was and whether you understand what *Information Theory* and Universal Machines such as computers are really about.

You can easily read the Dr. Seuss of *obsessives* Chomsky (my apologies Mr. Geisel) but can you read Shannon's 1948 paper on entropy and language? When you run Chomsky's writing through an entropy count it is quite revealing Take these words from an interview of Chomsky (taken from the *Chomsky Reader*) from four decades ago. When asked about personal influences he stated:

> *"Of course, there have been, but it is true that I rarely write about these matters. I am not writing about myself, and these matters don't seem particularly pertinent to the topics I am addressing. There are things that I resonate to when I read, but I have a feeling that my feelings and attitudes were largely formed prior to reading literature. In fact, I've been always resistant consciously to allowing literature to influence my beliefs and attitudes with regard to society and history …lots of my*

perceptions were heightened and attitudes changed by literature over a broad range — Hebrew literature, Russian literature, and so on. But ultimately, you have to face the world as it is on the basis of other sources of evidence that you can evaluate. Literature can heighten your imagination and insight and understanding, but it surely doesn't provide the evidence that you need to draw conclusions and substantiate conclusions."

That is a very good example of the *obsessive's* condescension. His words when put through an entropy measure provides a measure of 4.2.

In comparison here are words out of the mouth of a former president known for his condescension and obsession recently convicted on 34 counts of fraud.

"We didn't do a thing wrong … I am innocent. This was a disgrace."

This paragraph when put through an entropy measure also provides a measure of 4.2.

Frankly I see no difference between Chomsky on the one side of the political spectrum and Trump on the other, and neither does Information Theory! See what happens when you put Hitler's words through the same measure! I once revelled at a meme made of his name on a wall in New York City by an anonymous artist. The meme was in the way of Pac Man the famous video game … *it was Chomsky who ate up all that was in his path and left behind scat.*

If you cannot see where I am going with this can I recommend you read Alfred North Whitehead and Sir Bertrand Russell's *Principia Mathematica* or anything about programming and Universal Machines by scientists like Alan Turing.

When *Modernity* demands better, is your time too valuable to squander it away reading Rousseau, Descartes, Nietzsche and Chomsky? If you propose a *Modern* philosophy, it needs to be rooted in not merely what the best of past has to offer us, but as well as what *Modernity* has to offer us as well. By our sense of pragmatism, we need to be Modern in our *Geist* to come to terms with Modern issues. There was no great golden age as much as there has never been a great golden philosopher. If you haven't sorted this out yet, let me spell it out for you: My *Discourse* to you is about the meaning of *Modernity*.

There is also the issue of our *Welt Geist*. Many a past philosopher have been dystopic in their views. People like Malthus, Nietzsche, Hegel and Marx come to mind. If we must choose between *Dystopia* or *Utopia*, it seems logical to be Utopic. To a simple degree it is the question when you have a choice to be happy or sad, why not be happy … you will live longer. Why not utopic … for the uplifting nature of your philosophy will help you find a Modern way to the future.

If you are Dystopic in your *Geist*, then perhaps I should share with you the anecdote of the philosopher who wanted to prove he did not exist … *One*

afternoon he stepped out in front of an oncoming bus. Quod est demonstrat … um!

In the past the dystopic was the norm among most philosophers. In contemporary times, in the 1960's and 1970's again when Dystopia was the norm, Norman Borlaug thought otherwise and presented a utopic view of human possibility, becoming the father of the Green Revolution, and earning a Nobel Peace Prize in the doing. And yes he was a scientist, an agronomist, who was not dragged down by the Malthusian *Geist* or *Pop Culture* propogated at the time.

We understand clearly that humanity is in a foot race with disaster. We have too many people and many more hungry mouths are arriving each day. We have a turbulent international system that seems to be more interested in conflict than compassion. To come first in this foot race, humanity has to strive to be Modern and strive to be Utopic.

Remember, there are two type of people you will meet in the world, those who are part of the problem, and those who are part of the solution of the problems that confront us. Which of the two are you? Be honest now …

Perhaps the last time you studied Chemistry, Biology, Physics and Math was when you were in your teens. Perhaps you aced Psychology in High School, but got a B in Chemistry, Biology, Physics and Math. Now look at you, you are much older and can say you are up on Pop Culture, and not much more. You are not part of the solution are you?

There is a book that has gathered Einstein's finest ideas. It is titled "*Ideas and Opnions*." If you have not read this book, then you cannot call yourself modern and thoughtful. It should be a book you pick up and read from cover to cover.

Given the nature of our contemporary challenges, we cannot afford such luxurious self-indulgences as Rousseau, Descartes, Nietzsche or Chomsky ... Let their writing gather dust on the shelves shall we. We need to ask you to take Modern science books down and crack them open … or if you no longer visit to libraries, then go online and find a good set of digital resources. They are not too hard to find, such as *Ideas and Opinions* by Albert Einstein, or *The Feynman Lectures on Physics* (which are freely available as part of his estate … thank you Dr. Feynman). There is Erwin Schrodinger's "*What is Life?*" and *The Double Helix* by Dr. Watson of DNA fame. There is also Lev Landau's marvelous series of Physics books. There are Linus Pauling's books on Chemistry, the hydrogen bond and Quantum Chemistry (Linus Pauling won two Nobel Prizes, including a Peace Prize). There are books on solid State Physics by Purcell, Kittel and Bardeen (who won two Nobel prizes in Physics). The list is kong and distinguished.

Let me share with you a snippet from "*Ideas and Opnions*" that touches upon about the issue of the immortality of ideas and Einstein's views on education:

> *"Bear in mind that the wonderful things you learn in your schools are the work of many generations, produced by enthusiastic effort and*

infinite labor in every country of the world. All this is put into your hands as your inheritance in order that you may receive it, honor it, add to it, and one day faithfully hand it on to your children. Thus do we mortals achieve immortality in the permanent things which we create in common.

If you always keep that in mind you will find a meaning in life and work and acquire the right attitude towards other nations and ages."

There is not much you can do with a passing grade in psychology or anything metaphysical is there, except pour coffee as a barista or be judgemental and feel proud about your preconceptions. You might even be fixated on *Pop Culture*.

Let us set aside the misconception that merely being contemporary is also being modern. Contemporary means that it is happening in the present. Being contemporary does not in itself mean that you are Modern in your thinking.

The word *Culture* is misunderstood, misused or misinterpreted nearly every time it appears in print or is proclaimed. *Culture* simply means something that is cultivated. Someone has gone out to propagate a message for some specific reason, most time related to the pursuit of wealth or influence. Rarely is the pursuit of truth, virtue and understanding being cultivated. Most culture we see around us is based on vulgar thought. One should perhaps dispense with the word *Culture* if you can, when expressing your Welt Geist or philosophy.

For the most part at the heart of much of *Pop Culture* is the pursuit of profit. Would that not be a fitting description of fads that draws from Hollywood or Bollywood? And what does *Pop Culture* really represent … not the loftier aspects of human thought … but what has been cultivated with the populace, who haven't set themselves earnestly to the study of Chemistry, Biology, Physics and Math. There is little *Modernity* to be found in *Pop Culture* … and even less worthiness.

The term *Pop Culture* should perhaps be replaced with *Popcorn* – something that is both popular and corny. Figure it that the physicists, electrical and software engineers created the Internet only to see it clogged with *Popcorn* … At least half of what is on the visible web and much that is on the dark web is truly vulgar.

Remember now that humanity is in a foot race with disaster. Is it not clearly evident that we have far too many people, not enough food and fresh air and water … *and now, to boot, we have too much Pop Corn* … How can we push aside the vulgar?

So answer me this. Are you able to come up with valid and meaningful scientific ideas of your own? If you can then perhaps you will want to proceed with this *Discourse.* Science is in many ways the apex of human understanding. It is also the single and most meaningful measure of the *Modern*. If you can't understand science then perhaps you should not think

yourself Modern and stop kidding yourself that you really understand what is going on in this the 21st century.

In this *Discourse* I freely share ideas first expressed by Albert Einstein and some of his compatriots about what *Modernity* means. I will add some ideas of my own. Together these ideas will be challenging. Only you can answer this question: Are you up to the Challenge?

The Sky is Blue

If I were to state to you that '*the sky is blue'* how would you relate to this?

Would you smile and say, great … time to hit the beach?

Would you smile and say, great … time to write some poetry?

Would you smile and say, great … time to be metaphorical … life is good?

Would you smile and say, great time … to explain that the intensity of the scattering of light by the atmosphere goes as the fourth power of the frequency. That this effect is known as *Rayleigh Scattering*, and was first explained in 1871, over one hundred and fifty years ago. Would you say that it is the gaseous version of the *Tyndall Effect* which is the scattering of microscopic particulates suspended in a fluid.

I bet most of you just smiled at the blue sky and packed your bathing suit. Perhaps a handful started to compose a stanza in their head … *How Blue is the Sky* … one or two would have sense metaphor (these of you who are perhaps introverts).

Only the piteously few Modern and scientific types among you would have appreciated how the frequency of sunlight relates to scattering intensity in the Earth's atmosphere. You would have been introduced to this concept in either high school or first year university physics class. This would have been part of the body of knowledge that related to electromagnetism and optics, a branch of science that was pretty much sorted out a few centuries ago. It would also draw you into Quantum Physics.

If you didn't learn *Rayleigh Scattering* at school then you are nearly two centuries behind the times. So what do you think! Well. Let me ask you this. Why is it some evenings the setting sun sets clouds at the Western horizon red? What causes this?

Pollution you think since you have probably hear someone say this and so you think this by itself is an answer, shrugging the question off. Well it isn't. The answer is that it is caused by *aerosols* in the atmosphere that comes from many different sources … not all of which are pollution. If I were to ask you what an aerosol was could you at least tell me what this is?

> *An aerosol is a suspension of microscopic solid or liquid particulates in a gas. The term aerosol commonly refers to the mixture of*

particulates and gas, and not just to the particulate matter alone. Examples of natural aerosols are fog, mist or dust. Aerosols can be generated from natural or human causes.

The red sky at dusk may be due to a forest fire, a dust storm or the remnants of a volcanic eruption half way around the world. Or it may be caused by something man made such the pollution made in the city you reside or an industry close by.

Once again scattering of light is at play but now the *aerosol* scattering the sunlight is very much large in size than oxygen or nitrogen molecules and hence the scattering is at a red wavelength. The blue light is still being scattered by the oxygen and nitrogen in the air, however there are now aerosols which is scattering to a significant degree.

The other factor at play is that the Sun is now low to the horizon and the distance the sunlight has to travel is much greater, perhaps four of five times the vertical actual thickness of the atmosphere. It is only 100 km straight up into the vacuum of outer space. This 100 km height to outer space is known as the *von Karman* line. In comparative terms the thickness of the Earth's atmosphere compared to the radius of the Earth is roughly to the scale of what the peel is to an apple.

Together the size of the aerosol particulates and the distance the light travels through the atmosphere leads to a preferential scattering in the red part of the

spectrum. Incidentally Einstein learned this in high school in 1894. So why haven't you?

The mathematics for *Rayleigh Scattering* is straight forward. As a Modern question, if I were to ask you to think of a way of distinguishing between the different types of *aerosols*. Could you design a way of doing this? Could you sort out the pollutants?

How Fast is Fast?

Let me ask you another simple question. What is the fastest something can travel, say a particle in outer space. Could you answer this question from first principles or would you just state an answer and rely on someone else having done the elucidation for you? This is again something you should have learned in high school or university. It relates to a fundamental principle in Einstein's Theory of Special Relativity.

Say you have two frames of reference moving in uniform motion relative to each other. Say you measure that something is going the speed of light c in one frame, while the other frame is moving at speed v relative to the first frame. Will you measure light going at the speed c + v? Of course not and why not?

Einstein's two postulates are the reason why. In Einstein's Theory of Special Relativity we *postulatise* (if we are scholarly we have the right to make up our own words … right) that

Postulate 1: *The Laws of Physics are the same in all inertial frames of reference.*

Postulate 2: *The speed of light in vacuum (c) is the same for all observers, regardless of the motion of light source or observer.*

The first of these postulates actually dates back to the 17th century and Galileo Galilei. The term relativity relates to the fact we are undertaking a comparison of the relative position, the relative times and relative speed of two objects in relative motion.

So what you think! What practical value does such esoteric matters have?

Well if you have ever used *GPS* (Global Positioning System) two of the time corrections needed to get an accurate fix of your position on the surface of the Earth relates to miniscule time dilations due to both Einstein's Theory of Special Relativity and his General Theory of Relativity, which is also his Theory of Gravitation.

With regards to Einstein's Theory of Special Relativity, the clocks on the GPS satellites show a time dilation compared to clocks on the surface of the Earth due to the speed of the satellite's orbit. The result is an error of about – 7.2 microseconds/day in the satellite.

With regards to Einstein's Theory of General Relativity, there is also a gravitational time dilation, which is due to the gravity field of the Earth. Since the clocks on the Earth are deeper within the gravity well then the clock in orbit, the clocks on the satellite appear to run faster than the GPS receivers on the Earth by about 45.8 microseconds/day.

Combined, these relativistic time dilation cause the clocks on the satellites to gain 38.6 microseconds per day relative to the clocks on the ground, which if not corrected for would translate into an error measurement of several meters in your GPS position.

Let us go back to the question … will you measure light going at the speed c + v?

The relative speeds as seen in two frames of reference, (u in one frame and u' in the other frame) traveling at speed v relative to each other is given by the expression for the addition of speed in Special relativity, namely

$$u' = \frac{u + v}{1 + \frac{uv}{c^2}}$$

Using some simple calculus you find the extremum for this expression, that is the maximum speed possible, is when u' = u = c where c is the speed of light.

This is easy to confirm, set u' = u = c then

$$c = \frac{c + v}{1 + \frac{c\,v}{c^2}} = c$$

If you *accept the validity* of the Special Theory of Relativity, then this derivation is a definitive answer to this question. During Einstein's lifetime there were scientists who did not accept the validity of his Special and General Theory of Relativity. For the most part it was only in the decades after Einstein's death in 1955 that these theories became universally recognized and appreciated.

Photons of Light Energy

Light enters our eyes and our retinas create an inverted picture of what we are viewing. The electrical signals are sent to the occipital lobe of our brain which interprets what we see. This interpretation is a product of our experiences from the moment we are born to the moment that we look at something with our eyes.

The process of transduction, the means by which the photon energy is converted into electrical signals was only really sorted out in the middle of the 20th century. The road to this discovery started several hundred years before with the work of the likes of Al Hazen, Witelo, Leonardo da Vinci and Johannes Kepler (who is the patron of optometrists … but I bet you knew this). We also owe mention of Albert Einstein as well.

Transduction in the photoreceptors in our eyes is a result of a change to the shape of the rhodopsin molecule which releases an electrical signal that is carried through a network of neurons thru our brains to the occipital lobe. Transduction is a complicated and organic form of the *Photoelectric Effect*.

In 1921 when Albert Einstein won the *Nobel Prize in Physics* it was not for his work on Relativity. He won it for his work on the *Photoelectric Effect*. It should not surprise you to be told Einstein wrote over 350 science papers in his life time and only a small percentage were about his work in Relativity and Cosmology. To have some fun with the Nobel Prize Committee Einstein presented a lecture on his Theories of Relativity, for he felt he should have been acknowledged for this work.

If you say you don't know want the *Photoelectric Effect* is then perhaps you can be asked how sound was brought to the movies a few years after the 1921 *Nobel Prize in Physics*. It was using the *Photoelectric Effect* … as a way of transducing light signals into electrical signals, which were then amplified using radio tubes and then projected into the theater using speakers. It seems simple today but a century ago this was not an easy thing to do!

If you estimate how much money has been made off the talkies over the past one hundred years as movies were shown in theatres using sound equipment based on the *Photoelectric Effect* … then we are talking at least a trillion US dollars. There is a reason why people movie actors like Charlie Chaplin fêted the likes of Albert Einstein. Hollywood owed him a great debt for his genius …

Perhaps by the time you read this *Discourse* Hollywood and Bollywood will be a thing of the past? Just as technology evolves so does the appetites of the *Pop Corn* populace.

The *Photoelectric Effect* is the emission of electrons off a material due to impacting electromagnetic radiation. It was first explained in 1905 in a paper by Einstein. It was Max Planck who in 1900 hypothesized that the Energy E of a light photon is related to the frequency of the light ν by the expression

$$E = h\,\nu$$

It was Einstein in his 1905 paper on the *Photoelectric Effect* where he suggested a simple technique in which to measure h.

Following Einstein's suggestion, in 1912 the physicist Arthur L. Hughes and again in 1916 Robert Millikan accurately measured the energy of the emitted electron against the frequency of the incoming photons. Here is how Hughes explained this:

> "*Einstein suggested that, so far as the photoelectric effect was concerned, light could be regarded as being made up of tiny corpuscles, or quanta, each containing an amount of energy equal to hν, where ν is the frequency of the light and h is the famous constant which Planck had introduced into his theory of radiation 5 years earlier. In the absorption of light it was assumed that the quanta disappeared as such*

but transferred their energy to electrons within the metal and these then escaped as photoelectrons. Hence, the kinetic energy of an escaping electron (KE) should equal the energy of the quantum giving rise to it (hν), minus the work done in passing through the surface (p).

This result is expressed in the famous Einstein equation,

$$E = KE = h\nu - p$$

for the propounding of which Einstein later received the Nobel Prize."

Obviously when you calculate the slope of the line in his expression this gives you an accurate measurement for the Planck's constant h.

If you are as yet not convinced as to the importance of the *Photoelectric Effect* then ask yourself how your computer printer works? The page you are printing is pixelated by your computer then that pixilation is transferred onto the paper and nano-particulates of print material is adhered to the surface of the paper via the *Photoelectric Effect* then the page is heated to fuse the nano-particulates of plastic onto the paper.

You would have been introduced to the *Photoelectric Effect* in either high school or first year university physics class. If you weren't … well once again you missed out (or perhaps messed up in deciding to take soft subjects instead of the hard sciences).

Upwards of ten percentage of the wealth generated in the 20th century relates back to the discoveries made by Max Planck in 1900 ($E = h\nu$), and to Einstein and the *Photoelectric Effect*. At the turn of the 21st century it was stated by a Nobel Laureate that upwards of half of the wealth created in the 20th century arose from the Quantum Physics that was developed using the ideas presented by Planck and Einstein, things like transistors and all solid state devices that are made with Quantum Physics.

Light Amplification by Stimulated Emission of Radiation

Don't you just love acronyms! Does it sound familiar? Remember I mentioned we would return to stimulated emission when we looked at *Black Body Radiation*. For some of you its meaning is immediate … however for most of you it is not and so you need a bit of help.

LASER … where would we be without the Laser and its microwave equivalent the MASER. And yes, Albert Einstein and a paper he wrote in 1916, played a pivotal role in this amazing technology known as the laser! His contributions continue on to this day in the physics of LED (Light Emitting Diodes) which are in fact small solid state lasers.

If you took ill today you would be rushed to the hospital and put in the care of medical professionals who benefit from the basic and applied science that has been done since the time of Leonardo da Vinci. Every piece of medical equipment the medical practitioners would use to diagnose and treat your condition draws from modern physics.

You might then ask how say astrophysics and medical science are related. How science such as my *Two Parameter Turbulence Model* for planetary and exoplanetary systems are related to say the flow of blood in your veins and arteries. Think about this for a moment before you continue on reading this Discourse. See if you can find four correlations.

The first and most obvious correlation is that both astrophysics and medical science rely on mathematics, which relates back to Pythagoras' notion that *all things in nature can be described in terms of mathematics*.

The second correlation is when you are set inside say a machine, which is defined as a *Tomograph*, to have an X-ray, CT, MRI or PET scan, the entire machine is a product of basic and applied physics, and in personal terms so is the data collected of you and the manner it is incorporated into a *Tomograph*.

If the term *Tomograph* is new to you let me share a definition:

> *Tomography is the imaging of a physical object by sections uses any kind of penetrating wave energy. The method is used in radiology, archaeology, biology, atmospheric science, geophysics, oceanography, plasma physics, materials science, and astrophysics. Such a piece of equipment designed to provide sections for study is a Tomograph.*

These Tomographs were a product of physics, the more modern of which rely on technology developed in astrophysics, in particular particle physics and

nuclear astrophysics. Someone went out of their way to develop the technology for a specific use, and then helped to make this technology available for general use.

A rule of thumb is '*First comes the science then comes the technology!*'

The CCD (Charge Couple Devices) you have on your cell phone found its first applications on space vehicles like the Viking Lander sent by NASA to Mars in 1976, and to telescopes designed to gather light from galaxies billions of light years away. When they were first introduced in the 1970's the first CCD cost hundreds of thousands of dollars and were of poor resolution. Today the CCD in your cellphone is several thousand-fold times better in resolution and costs just a few dollars. CCDs or there more modern equivalent, CMOS, are what is used in many Tomographs. The inventors of the CCD William Boyle and George E. Smith won the 2009 Nobel Prize in Physics for their 1969 invention. The CCD rely on the photoelectric effect and quantum Physics.

It is also understood that the equipment uses transistor technology, both in the Tomograph and in the computers that are processing the images. Do you know how the different types of transistors work? Did you even know there are different types of transistors? Do you know the inventors of the first transistors won Nobel Prizes in Physics? Do you perhaps know who they are?

Third, were you to take out of the hospital all medical equipment that draws from mathematics as well as basic and applied physics, not even a stethoscope nor thermometer would remain. There also would not be electricity, lights, bells, no air conditioning, no sterile medical instruments and not even the medical instruments themselves. No microscopes, no drugs … nothing.

I mention medicine merely because it is the science that most directly affects the mortality of humans. When you are ill you want to be cured. Without mathematics and physics there would be no modern hospitals, no modern diagnosis and no modern cure. Modernity if very important.

On the road to becoming a doctor there is a gate that all med students have to walk thru – it is second year Organic Chemistry at university. I have a woman friend who wanted to become a doctor. At the end of her second year at university (about two decades ago) she got her final mark for Organic Chemistry and panicked ... 29 %! She called me up in a fret … and after I listened to her I asked her one simple question … *did you put your name on your final exam*? She couldn't remember so I called the Associate Dean of Science and asked if there was a final exam in Organic Chemistry that did not bear the student's name. There was a nameless exam. It turned out she hadn't put her name on her final. She had aced the final … Well today … she is an established doctor … and never forgets to sign things.

As we near the end of this Discourse let me share with you some words that Einstein set out as the reasons why he chose the life he followed. It comes from a short essay he wrote in French when he was sixteen:

> *"Here are the reasons that brought me to this plan. Above all is the individual disposition for abstract and mathematical thought, the lack of fantasy and of practical talent. There are also my desires, which have inspired in me the same resolve. This is quite natural. One always like to do those things for which one has talent. Besides, there is also a certain independence in the scientific profession that greatly pleases me."*

In some sense this is both the beginning the beginning and the end of this *Discourse*. This leaves me to ponder as to what is truly important in life. Here is a Sermon for you:

Perhaps it is to treat others how you yourself would like to be treated, with kindness, respect and compassion.

Perhaps it is to remember we live not merely for ourselves but for others and that we should strive to return more than we take in our lives so that others may benefit.

Perhaps it is to remember that we are mere passengers on our ride through space and time and we must be optimistic and uplifting.

Perhaps it is to choose to be part of the solution to problems as opposed to being the problem.

Perhaps it is to realize how precious time is and how little of it we have in our lives.

Perhaps it is to realize how important mathematics and science is and how much this makes for *Modernity*!

Perhaps it is the simple realization that what we do helps us earn our place in Heaven.

Wait … you ask how this can be? To ask to be scientific and Modern yet speak of earning a place in heaven. The Latin word *Sermon* means *Discourse*

Whether Heaven exists or not is very much like asking what is past the Event Horizon in a Black Hole … we can venture forth past the threshold of both and not be able to tell to someone outside the realm what is within.

How would someone who profess to be a Modernist and to be scientific speak about Heaven? If you read Einstein's thoughts carefully, he thought along such terms as well. Like him I do not believe there is an *Anthropomorphic Deity* looking down upon my day to day toils. But like him I believe there is a reason why the universe, and mathematics as well as physics are so self-consistent,

Like Einstein I believe there should be some concept of good that we all might aspire to. *Earning one's place in Heaven* is such a good, for this asks us to act with kindness and compassion, to think of others and to try to make the

world a better place. A person who follows in the footsteps of Albert Einstein would view not merely science as being self-evident but the humanity as well. We strive and through

"the striving frees us from the bonds of the self and makes us comrades of those who are the best and the greatest."

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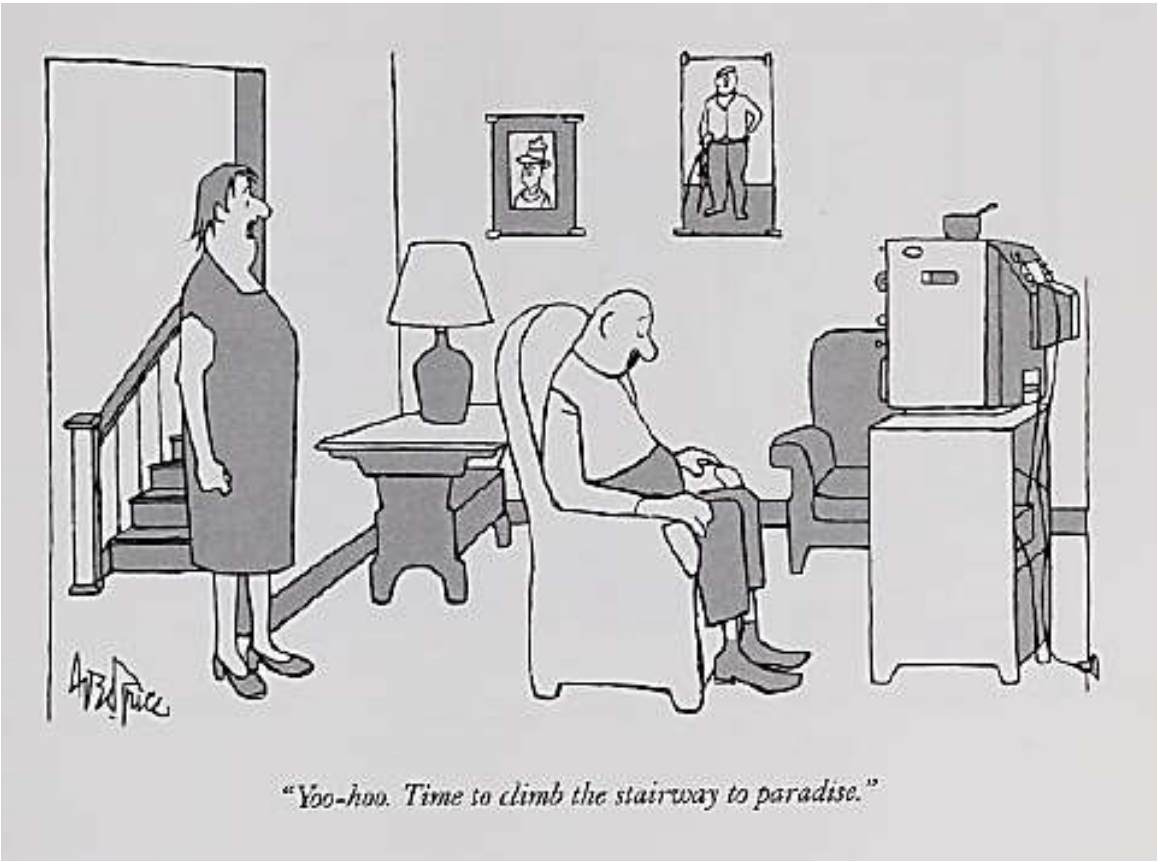
Pictorial: Yoo – hoo, time to climb the stairway to Paradise



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